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PRETI (G.). **Marciume del Pomidoro nella Liguria occidentale '*Solanum lycopersicum*'.** [Rot of the Tomato '*Solanum lycopersicum*' in western Liguria.]—*Riv. Pat. Veg.*, xxiii, 7-8, pp. 291–301, 4 figs., 1933.

The author gives a brief account of a severe outbreak of early blight (*Alternaria solani*) on the basal parts of tomato plants in the province of Savona, an important contributory factor to which is stated to have been the nature of the local clay soils, which tend to retain a high degree of moisture after irrigation. The attack was most marked in the region of the collar, which was more or less completely disorganized and blackened. Some recommendations are made for the control of the disease.

ALLAIN (A.). **Contribution à l'étude du Phytophthora cambivora.** [A contribution to the study of *Phytophthora cambivora*.]—*Comptes rendus Soc. de Biol.*, xciii, 28, pp. 1405–1407, 4 figs., 1933.

The writer has studied the morphology and cytoplasmic characters of *Phytophthora cambivora* [*R.A.M.*, xii, p. 337], the agent of ink disease of chestnuts, in Corrèze, France. His observations confirm those of previous workers in regard to the general morphology of the fungus.

SERVAZZI (O.). **La disinfestazione delle Castagne d'esportazione con il metodo dell'immersione in acqua a 50° C./45′ in rapporto al problema delle muffe.** [The disinfection of export Chestnuts by immersion in water at 50° C. for 45 minutes in connexion with the problem of moulds.]—Reprinted from *Boll. Lab. Sperim. Fitopat. di Torino*, x, 30 pp., 1933.

This is a summary review of the work done up to 1933 at the Royal Phytopathological Observatory of Turin for the purpose of determining the best methods for pre-shipment treatment of export chestnuts from Piedmont to preserve them from attacks by insects and moulds [*R.A.M.*, viii, p. 614; ix, pp. 6, 142]. The results [which are tabulated], taken in conjunction with the experience reported by Italian exporters and United States consignees, show that the method now almost generally applied in Piedmont of steeping the chestnuts in water at 50° C. for 45

minutes, while effective against the insects, noticeably increases the natural susceptibility of the fruits to infection with moulds, and promotes the development of the latter both outside and inside the nuts. The mould flora involved is extremely varied, but 14 species belonging to 11 genera [an annotated list of which is given] predominate. It was found that drying after treatment, either in the open or under controlled conditions, is not sufficient to check mould development. The addition to the water of different fungicides proved to be either ineffective against the moulds or to affect adversely the quality and flavour of the nuts, with the exception of formaldehyde which proved fungicidal even at a concentration as low as 0·25 per cent. It is recommended, therefore, that before export the chestnuts should be treated by the usual immersion method, but with the addition of 0·50 per cent. formalin to the water.

TROTTER (A.). **Contributi alla patologia del Nocciuolo. I. Il seccume dei fusti da Cytospora.** [Contributions to the pathology of the Hazel Nut. I. The drying-up of the stems caused by *Cytospora*.]—*Ricerche e Divulg. Fitopat. per la Campania ed il Mezzogiorno*, Portici, ii, pp. 17–27, 3 figs., 1933. [Abs. in *Riv. Pat. Veg.*, xxiii, 7–8, pp. 324–325, 1933.]

The author studied a die-back of the stems of hazel nut [*Corylus avellana*] trees in Naples, leading to many of the stems being broken off at the lowest part of the lesion. This disease is stated to have been described by Savastano as 'disgelatura traumatica' [traumatic frost injury], and to be identical with that known in Catalonia under the name 'sol-cuit' [sun scorched]. Isolations from the diseased tissues yielded a species of *Cytospora* entirely different from that which is always present as a saprophyte on the nuts (*C. corylicola* Sacc.). It is believed that the fungus enters the host tissues through wounds, and that it may be controlled by pruning off and burning all the infected stems, disinfection of the pruning wounds, and by swabbing the dormant stems with iron sulphate solution.

LINDEIJER (EGBERTA J.). **Die Bakterienkrankheit der Weide (verursacht durch Pseudomonas saliciperda n. sp.).** [The bacterial disease of the Willow (caused by *Pseudomonas saliciperda* n. sp.).]—*Phytopath. Zeitschr.*, vi, 4, pp. 371–374, 1933.

The writer's studies on the symptoms, etiology, distribution, and control of the bacterial disease of willows (*Salix alba*, *S. amygdalina*, and *S. purpurea*) in Holland are briefly recapitulated, with a diagnosis of the causal organism, *Pseudomonas saliciperda* [*R.A.M.*, xii, p. 60].

WALLACE (G. B.). **Tanganyika Territory, Department of Agriculture. Monthly Letter, March, 1933, Annexure 2. Root disease caused by Ustulina.**—3 pp., 1933.

Attention is drawn to the detection, in February, 1933, for the first time in Tanganyika, of the well-known root parasite, *Ustulina zonata*, on the collar and two exposed roots of *Acacia*

campylacantha. The distribution, fructification, symptoms, and control of the fungus are briefly described in popular terms.

STAHEL (G.). **The witchbrooms of Eugenia latifolia Aubl. in Surinam caused by Pseudomonas hypertrophicans n. sp.**— *Phytopath. Zeitschr.*, vi, 4, pp. 441–452, 5 figs., 1 graph, 1933.

Eugenia latifolia, a common tree in Surinam, bears witches' brooms resembling those caused by *Marasmius perniciosus* on cacao [*R.A.M.*, xii, p. 207]. In the early stages the twigs are 1 to 3 times as thick as the normal and grow in an orthotropic direction. The pale young leaves are irregularly curled, the fully grown ones often perforated, and the terminal bud dies prematurely. The lateral and dormant buds of the primary broom grow out to secondary branches, growth continuing for a year or more, unlike the brooms on cacao which die in a few weeks without making any secondary growth.

Shining, jelly-like drops occur in nearly all the intercellular spaces of the tissues of the brooms, particularly in the pith. These contain capsulate bacteria, the capsule being $1\frac{1}{2}$ to 2 μ thick, and also pear- or spindle-shaped involution forms. In the leaf mesophyll large mucilaginous masses are often observed displacing the spongy parenchyma. A few non-capsulate bacteria may be detected in all parts of the embryonic tissue of the young brooms, occurring in single rows and without involution forms.

Sections through the youngest internodes of the witches' brooms showed a marked hyperplasia of the pith, the cortex also being abnormally thick, whereas the xylem was poorly developed. The normal sclerenchyma ring of the deeper part of the cortex is absent in the brooms, the thick, pointed, unicellular hairs on the epidermis of which are unusually numerous. The oil glands in the brooms are radially enlarged as a result of cortical hypertrophy. The thickness of the palisade tissue is reduced from 85 μ in normal leaves to 60 μ in infected ones.

The bacterium of the witches' brooms on *E. latifolia*, which was readily isolated, is a short rod measuring 1·2 to 2·8 by 0·6 to 0·8 μ, with a single polar flagellum, and is generally single though in young cultures rod-shaped chains, 10 to 20 μ or longer, may develop. In freshly isolated colonies small capsules, 0·5 μ in thickness, are formed round the cells, but these disappear on prolonged culture. Typical involution forms developed in saccharose bouillon with 8·6 per cent. sodium chloride. The organism is regarded as a new species of *Pseudomonas* and is named *P. hypertrophicans*. Apparently this is the first record of the production of typical organoid (as opposed to histoid) galls by a bacterium. *P. hypertrophicans* is aerobic, Gram-positive, non-acid-fast, forming circular, slightly raised, whitish, glistening, translucent colonies, with a smell of new bread, on saccharose bouillon agar. No growth occurred on gelatine, steamed bananas, or Uschinsky's solution, and little on neutral bouillon with carbohydrates until after the addition of 2 to 3 per cent. saccharose. Milk was not coagulated or peptonized, and no nitrite, indol, or ammonia was produced, Formic and lactic acids are formed in bouillon with saccharose, dextrose, and fructose. *P. hypertrophicans* is sensitive to desiccation.

being killed within ten hours in a well-aerated room at 80 per cent. atmospheric humidity, and within twelve at 90 per cent. The thermal death points of freshly isolated strains and twelve-week-old cultures of the organism are 48° and 49° C., respectively. The hydrogen-ion growth range on saccharose bouillon is P_H 5·3 to 8·1, development being more profuse towards the acid side.

Witches' brooms were readily produced through needle punctures with agar colonies of the pathogen. If the tissue round the dormant buds is punctured, the latter mostly die; otherwise a mass of very distorted, minute brooms is formed. The inoculation of developing buds results in normal broom production, but should a young, growing internode be punctured, the full-grown twig looks almost normal except for a slight thickening at the point of inoculation. The organism was recovered from a broom produced by inoculation and used successfully in fresh inoculations. Cultures maintained their virulence for at least 105 days. No brooms were produced when bacteria from a young agar culture were smeared on the buds and protected from desiccation by a glass tube. The disease spreads rapidly, probably by means of insects feeding on the sappy brooms and afterwards on the growing internodes of normal twigs.

Davis (D.). **Polyporus shoreae (Sal root fungus) in Bahraich Division.**—*Indian Forester*, lix, 8, pp. 507–512, 1933.

The sal (*Shorea robusta*) root-rotting fungus, *Polyporus shoreae* [*R.A.M.*, ii, p. 350], was already present in Bahraich Division [United Provinces] in 1923, and in 1928 it was found to have destroyed a large number of trees over an area of 500 acres, chiefly on low-lying ground. In connexion with the regular work of felling, the dead and dying trees on the affected site were marked in December to January and again in May, 1929, when the total amounted to 1,795, of which between 1,000 and 1,500 are believed to have been directly killed by the fungus. Out of 135 trees bearing sporophores of *P. shoreae* in May, 1929, seven were dead in February, 1933, 25 dying, 31 with sporophores but no other symptoms, and 72 apparently healthy, with no fruit bodies at the base. It is evident, therefore, that *S. robusta* may not die for some year after infection by *P. shoreae*, and it may even survive the attack and recover completely.

Voglino (P.). **Sopra un deperimento dell' Araucaria imbricata.** [On a wilt of *Araucaria imbricata*.]—*La Difesa delle Piante*, x, 3, pp. 37–39, 2 figs., 1933.

In the spring of 1933, the leaves of *Araucaria imbricata* trees at Stresa developed a greyish-green or pale brown discoloration, became readily detachable from the branches, and bore punctiform or elongated pustules up to 2 mm. long on both surfaces, but especially the upper, sometimes arranged in lines parallel to the midrib but converging at the base. These bore the perithecia of a *Didymella*, the hyphae of which were blackish-yellow, almost fuliginous, near the perithecia, while those deeper in the disorganized tissues were almost hyaline, and measured 2 to 2·5 μ in diameter.

The blackish or dark brown, globose or piriform, subepidermal

later erumpent perithecia measured 240 to 300 by 240 to 250 μ. The oblong-clavate asci measured 80 to 90 by 4·5 to 6 μ, and contained eight hyaline, elliptical, occasionally subovoidal spores, broadly rounded at the apex, slightly constricted at the only (median) septum, and measuring 9 to 12 by 3 to 4·5 μ (average 10 by 3·5 μ). The paraphyses (one to each ascus) were filiform, hyaline, continuous, simple, and about twice the length of the asci.

The author considers this organism to be a new species, which he names *D. araucariae*. A Latin diagnosis is given.

SCHMITZ (H.). **The toxicity to wood-destroying fungi of coal-tar creosote-petroleum and coal-tar creosote-coal-tar mixtures.** —*Proc. Amer. Wood Preservers' Assoc.*, xxix, pp. 125–139, 2 figs., 1 graph, 1933.

A fully tabulated account is given of the writer's investigations on the comparative toxicity to malt agar cultures of *Fomes annosus* and *Trametes serialis* [*R.A.M.*, xi, p. 758] of three samples of coal-tar creosote, 8387, 8401, and 8403, one of coal-tar (8400), and three of petroleum, 8388, 8402, and 8404.

It is apparent from the resultant data that the initial toxicity of the coal-tar creosote-coal-tar mixtures (50 parts of each by volume) is considerably higher than that of coal-tar creosote-petroleum compounds. For instance, representing as 1 the toxicity to *F. annosus* of creosote 8387, the toxicity of a 50/50 mixture of creosote 8387 and petroleum 8388 would be equivalent to about $\frac{1}{7}$, the corresponding figure when coal tar 8400 was used in place of petroleum being about $\frac{1}{3}$. With a 25/75 mixture the figures were $\frac{1}{24}$ and $\frac{1}{7}$, respectively.

The most toxic of the three samples of creosote was 8387, which killed both fungi at a 0·075 per cent. concentration, while 8401 was the least so (0·35 per cent. for *T. serialis* and 0·45 per cent. for *F. annosus*). The coal-tar sample was only moderately toxic, probably owing in part to its small content of low-boiling fractions, while the three samples of petroleum were essentially non-toxic even at a strength of 10 per cent. About $1\frac{1}{2}$ times as much of the most toxic creosote 8387 in a 50/50 creosote-coal-tar mixture and $2\frac{1}{2}$ times as much in a 25/75 mixture was necessary to kill *T. serialis* as with the undiluted creosote. On the other hand, less creosote 8401 in creosote-coal-tar mixtures was required to destroy *F. annosus* than with undiluted creosote. In the 50/50 coal-tar creosote and petroleum mixtures, nearly four times as much of the highly toxic 8387 was necessary for the destruction of *F. annosus* as with the creosote alone, and six times as much in a 25/75 mixture.

SCHRENK (H. v.). **Significance of toxicity determinations from a practical standpoint.**—*Proc. Amer. Wood Preservers' Assoc.*, xxix, pp. 140–155, 1933.

In the light of current literature and contemporary investigations [which are summarized and discussed], the writer deals with the practical significance in timber preservation of toxicity determinations of creosote and creosote combinations [see preceding abstract]. Attention is drawn to three essential steps in developing

the relationship between toxicity tests and utility in service, namely, (1) uniformity of toximetric determinations, all workers using the same cultural methods and identical strains (not only species) of fungi; (2) the examination, as to distilling points and toxicity, of as many creosote oils as possible from timbers (preferably hardwoods) after a considerable period of service; and (3) the estimation of a correlation between the initial toxicity of the oils and their toxicity after various periods of service.

Flerov (B. C.) & Popov (C. A.). **Methode zur Untersuchung der Wirkung von antiseptischen Mitteln auf holzzerstörende Pilze.** [Methods for the investigation of the action of antiseptic preparations on wood-destroying fungi.]—*Angew. Bot.*, xv, 4, pp. 386–406, 3 figs., 1933.

All the current methods of testing timber preservatives are stated to be open to a number of objections. The writers therefore devised the following procedure based as far as possible on natural conditions. A layer of garden soil is placed in an Erlenmeyer flask, and a section of untreated wood (e.g., pine sapwood) laid on it; water is added at the rate of 40 to 50 per cent. of the weight of the soil and a section of wood saturated with the experimental antiseptic placed on top. The flasks should be kept at a temperature of 25° to 27° C. In a test with *Coniophora cerebella* [*C. puteana*] the optimum relative humidity for growth was found to lie between 40 and 50 per cent. This fungus and *Fomes annosus* were selected as the standard organisms for preservative trials in accordance with the recommendations of the Berlin Congress [*R.A.M.*, x, p. 357]. *Merulius lacrymans* should also be included in tests on antiseptics destined for use in buildings, since it has been found that this fungus shows marked deviations from the results with the two others. The [tabulated] results of an experiment to determine the *doses toxicae* of some water-soluble antiseptics to *C. puteana*, *F. annosus*, *M. lacrymans*, and *Lentinus squamosus* [*L. lepideus*] show marked discrepancies between the data obtained, respectively, on agar and wood.

Napper (Maude E.). **Observations on spore germination and specialization of parasitism in Cystopus candidus.**—*Journ. Pomol. and Hort. Science*, xi, 2, pp. 81–100, 2 figs., 1 graph, 1933.

A brief account is given of the author's investigations of some points in the biology of *Cystopus candidus* on various crucifers in Great Britain, in the course of which it was found that, provided all other factors are favourable, the conidia germinate at temperatures ranging from 1° C. to about, but not above, 20°, provided that they have been cooled down to these temperatures from one above 20° to 22°. It was also shown that the conidia do not germinate unless first dried so that their maximum content in water has been reduced by about 30 per cent. (within the limits of 28 and 36 per cent.). There was evidence that in nature this reduction in the water content of the conidia is directly related to the drying of the host tissues, which in its turn is in direct relationship to weather conditions, and that the more rapid the loss of water

the shorter is the period required for germination, and the higher the percentage germination obtained, when sown in water. Within wide limits, the age of the conidia did not appear to be a factor controlling their germination. The latter occurs through the ejection of zoospores in a more or less imperfectly differentiated mass into a rounded vesicle, in which their formation is completed. The length of their period of motility decreases as the temperature increases. Histological studies showed that in susceptible plants infection invariably occurs through the stomata; in resistant plants the germ-tube was seen to enter the stomatal chamber, but its further growth never proceeded beyond the formation of a haustorium.

Further work, including cross-inoculations of 25 species or subspecies belonging to 13 genera of the Cruciferae, collected from widely separated parts of Great Britain, showed the existence of at least 21 different biological forms of *C. candidus*, all of which can infect *Brassica alba* [cf. *R.A.M.*, x, pp. 131, 556]. The fixity of these forms, indicated by the cross-inoculation experiments, was confirmed by field observations, since wherever different cruciferous plants were growing side by side, it was common to find one type of host heavily infected, without a trace of infection in the others. However, some forms, usually the most common and generally distributed (e.g., those on *Capsella bursa-pastoris* and *Arabis alpina*) have an overlapping host range which may extend to some six different genera. The biological form on *Brassica oleracea* and its varieties was commonly found in the extreme south-west of England, and is comparatively rare elsewhere, and that on rape (*B. rapa*) appears to be restricted to certain parts of Somerset. No 'bridging' hosts and no appreciable varietal resistance have been found.

VERONA (O.). **Sul cosidetto 'vaiolo' del Cavolfiore.** [On the so-called pox of Cauliflower.]—*Boll. R. Ist. Sup. Agr. di Pisa*, viii, pp. 291–300, 1 pl., 1932.

A disease of cauliflowers in the neighbourhood of Pisa, characterized by the production of small, roundish, black spots on the corymbs, sometimes with resultant rotting, is caused by various species of *Alternaria*, including *A. brassicae* [*R.A.M.*, ix, p. 230; xiii, p. 3] and *A. tenuis*, as well as by other fungi, such as *Macrosporium commune*, *Aspergillus niger*, and *Cladosporium herbarum*, either alone or in combination with the *Alternaria* spp.

NEILL (J. C.) & BRIEN (R. M.). **Occurrence of dry rot on Rape and Chou Moellier in the field.**—*New Zealand Journ. of Agric.*, xlvii, 1, pp. 19–20, 2 figs., 1933.

Stem cankers on the chou moellier [marrow-stem] variety of kale [*Brassica oleracea acephala*] and on rape [*B. rapus*] in New Zealand yielded the highly virulent strain 11 B of *Phoma lingam* [*R.A.M.*, vii, p. 70; xii, p. 481], this being the first New Zealand record of the disease on these hosts in the field. One field was ploughed up from grass for the first crop of swedes in 1930–1, followed by rape in 1931–2; in 1932 it was sown with a mixture of chou moellier and swedes. By May, 1933, practically all the

swedes had succumbed to dry rot, and the chou moellier showed numerous cankers. An adjoining field carried rape, which had been twice fed off, leaving only the stems, almost every one of which showed a dry-rot lesion spreading down from the top. Rape and chou moellier are therefore dangerous crops with which to precede swedes or turnips in a short rotation in the same or neighbouring fields.

JENKINS (ANNA E.). **Further studies of Lima-Bean scab.**—*Phytopath.*, xxiii, 8, pp. 662–666, 1 fig., 1933.

Costa Rica, Nicaragua, Guatemala, and El Salvador (Central America), the Dominican Republic, and possibly Jamaica are added to the known range of Lima bean (*Phaseolus lunatus*) scab (*Elsinoe canavaliae*), previously reported from Cuba, Porto Rico, and Mexico [*R.A.M.*, xii, p. 742]. The Guatemala specimen, dated 1890, now constitutes the earliest known material of the disease. Diseased Lima beans, alleged to be of Jamaican origin, were recently intercepted in a passenger's baggage entering the United States.

Failure to isolate *E. canavaliae* from infected dry pods after nearly five months either at room temperature or 17° C. suggests that the fungus was no longer viable. Ascospores removed from pod lesions and kept at 8° remained hyaline or pale for a month, whereas those in fresh lesions kept moist for a few days were reddish-brown. Cultures of *E. canavaliae* made no growth at 0°, a little at 5°, and increasing amounts up to 25°.

BOBKO (E. V.) & BELVOUSSOV (M. A.). **Importance du bore pour la Betterave à sucre.** [Importance of boron for the Sugar Beet.]—*Ann. Agron.*, iii, 4, pp. 493–504, 3 figs., 1933.

After a brief review of the literature dealing with the boron requirements of various plants, the authors describe their own experiments with flask cultures of sugar beet seedlings on Follen's nutrient medium. In the absence of boron, a week after their transfer to the flasks, the plants showed signs of lagging in their development, and the young leaves dried and blackened as soon as they emerged from the buds; at the end of 25 days all the seedlings were dead. On the other hand, in two flasks to which boric acid at the rate of 2 mg. per l. was added a fortnight after the transfer of the seedlings, the latter immediately responded by the production of fresh leaves to replace the dead ones, and the roots formed new ramifications, the further development of the seedlings continuing normally. When, however, some of these plants were transferred later on back to the medium without boric acid, their further growth was delayed, and their dry weight at the end of the experiment was significantly less than that of the seedlings uninterruptedly grown in the presence of boron. These tests are considered to support Brandenburg's findings regarding the curative effect of boron against the heart rot of beet [*R.A.M.*, xii, p. 2], a further confirmation of which was supplied by the authors' pot experiments, in which beet seedlings were grown in soil with a high lime content with and without boric acid. The results showed that the addition of this substance completely neutralized the detri-

mental action of an excess of lime on the beets [ibid., ix, p. 757], and even rendered it beneficial to the yield of the crop.

GOTO (K.). **Onion rusts of Japan I.**—*Journ. Soc. Trop. Agric.*, v, 2, pp. 167–177, 2 figs., 1933.

In order to aid in determining whether both *Puccinia allii* and *P. porri* cause onion rust in Japan [*R.A.M.*, ix, p. 82; xi, p. 619], the writer carried out comparative biometrical and morphological studies on material collected in different localities, supplemented by inoculation experiments with the various strains thus obtained.

The orange-yellow, globose to elliptical or ovoid uredospores of 26 strains comprising the northern rusts on *Allium fistulosum* measured 30 to 88 by 4 to 10 μ (mean 45 to 50 by 5 to 6 μ), the corresponding figures for 26 southern strains on the same host being 10 to 90 by 4 to 9 μ (44 to 50 by 5 μ), for one on *A. scorodoprasum* 18 to 40 by 3 to 8 μ (30 by 6 μ), and for three on *A. bakeri* 10 to 50 by 4 to 8 μ (35 to 40 by 5 to 6 μ). The number of germ-pores ranged from 7 to 14 (mean 8 to 11) in the 26 northern strains, from 7 to 12 (7 to 11) in the 26 southern on *A. fistulosum*, from 7 to 10 for the *A. bakeri* strains, and from 7 to 12 for a German strain on *A. fistulosum*.

The teleutosori of the southern strains on *A. fistulosum* are persistently sub-epidermal, greyish-black to black, round to elliptical or deformed, 0·2 to 2·8 by 0·1 to 1·8 mm. (mean 0·5 to 0·8 by 0·3 to 0·5 mm.); those on northern material are blackish-brown when covered but inclined to rupture, when they are greyish or brownish- to blackish-grey, fusiform, and measure 0·3 to 4 by 0·2 to 2·5 mm. (mean 1·0 to 2·0 by 0·5 to 1·0 mm.) compared with 0·2 to 3 by 0·2 to 1·5 mm. (mean 0·8 to 1·5 by 0·5 to 1·0 mm.) for the covered teleutosori. The paraphyses of the southern strains resembled those of European specimens of *P. allii*, while those of northern strains resembled *P. porri*, the *A. bakeri* specimens being intermediate.

Inoculation experiments on *A. fistulosum* showed that teleutosori formed abundantly in the northern strains during the winter and sparsely towards the spring, when uredosori were produced in large numbers. In the southern strains teleutosori appear to be rarely produced. In general, the northern strains were less pathogenic to *A. cepa* than to *A. fistulosum*, the southern strains being still less virulent. The northern strains produced abundant teleutosori on *A. scorodoprasum*. *A. bakeri* and *A. odorum* resisted infection from *A. fistulosum*, while *A. porrum* developed only a few pustules containing uredospores and one covered teleutosorus on inoculation with a northern strain, another northern and a southern strain giving negative results.

KAISER (P.). **Sellerie-Rost—Sellerie-Schorf!** [Celery rust—Celery scab!]—*Gartenflora*, lxxxii, 8, pp. 229–230, 1933.

So severe is the damage caused in German celery plantings by scab (*Phoma apiicola*) [*R.A.M.*, xi, p. 91] that cultivation is often unprofitable unless drastic control measures are adopted. This disease is frequently confused with rust (*Puccinia apii*) [ibid., v,

p. 532], a comparatively harmless leaf infection. Scab may be combated by cultural practices which are briefly indicated.

Woodroof (Naomi C.). **Two leaf spots of the Peanut (Arachis hypogaea L.).**—*Phytopath.*, xxiii, 8, pp. 627–640, 6 figs., 1933.

Attention is drawn to the occurrence of two leaf spots on groundnuts [*R.A.M.*, xii, p. 357], and to the prevailing confusion in the description and nomenclature of the causal organisms. From a comparative study [full details of which are given] of the relevant literature and of herbarium material, the writer concludes that these two diseases occur in nearly all groundnut-growing areas, including Georgia where her field observations were made.

Cercospora arachidicola Hori (*Ann. Rept. Nishigahara Agric. Exper. Stat.*, Tokyo, p. 26, 1917), syn. *C. arachidis* P. Henn. var. *macrospora* Maff. [*R.A.M.*, xi, p. 20], produces irregularly circular or elliptical, often confluent, dark brown to black spots, 1 mm. to 1 cm. in diameter, surrounded by a yellow halo. The mycelium is both internal and external, inter- and intracellular, and without haustoria. The conidiophores of the fungus are amphigenous and may emerge through the stomata or between or through the outer epidermal cell walls. They are subgeniculate, 21·6 to 40·5 by 3·2 to 4·5 μ, yellowish-brown, continuous or uni- to biseptate, with distinct scars marking the point of attachment of the conidia, which are hyaline to pale yellow or slightly olivaceous, obclavate, measure 37·8 to 108 by 2·7 to 5·4 μ, and are 4- to 12-septate, usually 5 to 7. Spermogonia are formed on the fallen leaves late in September or early in October. The mycelium grows very slowly in culture, forming a dense, black mass; conidia have not been observed under artificial growth conditions.

The spots produced by *C. personata* are circular, 1 to 7 mm. in diameter, surrounded by bright yellow halos on the upper surface, and sometimes by pale yellowish-green ones on the lower. The mycelium is entirely internal, branched haustoria being formed in the palisade and spongy mesophyll cells. Tufts of conidiophores develop on the lower leaf surface. The stems and leaf petioles often bear elliptical spots. The continuous or uni- to biseptate conidiophores are reddish-brown, often with hyaline apices, subgeniculate or shouldered, with conspicuous scars of conidial attachment. They develop from loosely stromatic subepidermal mycelial masses, frequently in the substomatal cavities, and rupture the epidermis on emergence. The light brown to olivaceous, obclavate to clavate or cylindrical conidia measure 18 to 60 by 5·4 to 10·8 μ and are 1- to 7-septate. Spermogonia develop during the autumn.

C. arachidicola seems to occur fairly consistently year after year, whereas the development of *C. personata* is erratic, possibly depending on the weather; the latter is, however, the more destructive of the two leaf spots.

Briant (A. K.). **Maladies affecting Arrowroot in St. Vincent.**—*Trop. Agriculture*, x, 7, pp. 183–188, 4 figs., 1 diag., 1933.

After referring to the fact that 'burning' disease (*Rosellinia ? bunodes*) of arrowroot [*Maranta arundinacea*], first recorded in St. Vincent in 1891, occurs every year in very slowly spreading,

definite patches, the author briefly describes a survey made of the incidence of the disease on a large number of estates in the island. This demonstrated that the affected patches were often in hollows where the subsoil was wet and sandy, while unaffected places in the immediate vicinity had a dry subsoil. These wet subsoils occur even on slopes, the drainage water of which tends to collect in depressions running down the slope, which are thus kept constantly moist.

The author considers that the presence of *Rosellinia* in a field does not necessarily result in parasitism, even if a suitable host is present. In his opinion, the fungus is a common saprophytic inhabitant of soils, especially those rich in organic material, the pathogenic capacity of which depends entirely on the presence of certain conditions, of which excessive moisture is the chief.

Prevention consists in adopting improved draining methods [which are indicated] and in planting disease-free material.

The type of disturbance in the arrowroot rhizome known as 'cigar' or 'long' root is distributed fairly generally throughout St. Vincent. A field planted with arrowroot for the first time for several years seldom produces cigar roots during the first and second years, but their number apparently increases with each successive ratoon. These roots contain little starch but much fibre, and the internodes are generally long. No evidence was obtained of parasitic origin, and the condition appears to be due to particular soil factors, such as mineral deficiency. Parts of fields where animals had been penned were observed to have produced no cigar roots, though they were abundantly present in the other parts of the same field.

Genty (P.). **Note complémentaire aux truffes de Bourgogne.** [A supplementary note on the truffles of Burgundy.]—*Bull. Soc. Bot. de France*, lxxx, 1–2, pp. 69–72, 1933.

Further notes are given on the truffles of Burgundy [*R.A.M.*, xii, p. 198], in which seven more species of *Tuber* and related genera are described in popular terms. Of these, only *T. moschatum* and *Chaeromyces meandriformis* ('truffe blanche') are of culinary interest.

Libutti (D.). **L'antracnosi o vaiuolo della Vite.** [Anthracnose or small pox of the Vine.]—*L'Istria Agric.*, N.S., xiii, 13, pp. 284–289, 1 fig., 1933.

This is a brief popular account of vine anthracnose [*Gloeosporium ampelophagum*] in Istria, together with some recommendations for its control. Special stress is laid on the necessity of preventive measures, among which swabbing the vine stocks once or twice during winter with a solution of 30 kg. iron sulphate and 3 kg. sulphuric acid in 100 l. water, and the careful removal of all infected vine débris from the vineyards, are considered the most effective.

Clouston (D.). **Agricultural Botany, 1932–1933.**—*Rept. North of Scotland Coll. of Agric. for the year 1932–33* (Aberdeen Journals Ltd.), pp. 8–10, 1933.

The following are among the plant diseases mentioned in this

report. Turnips suffered exceptionally severe damage from mildew [*Erysiphe polygoni*: *R.A.M.*, vii, p. 132]. Prompt action on the part of local growers appears to have arrested the spread of 'red core' of strawberries [*P.* (?) *cinnamomi*: ibid., xii, p. 7], no further cases of which were reported in the district during the period under review. One case of 'brown patch' of lawns due to *Rhizoctonia* and *Fusarium* spp. [ibid., xii, p. 450] was investigated.

Successful control of tomato leaf mould [*Cladosporium fulvum*] was given by the application of $\frac{1}{8}$ oz. shirlan paste and $\frac{1}{4}$ oz. agral I in 1 gall. water [ibid., xiii, p. 10].

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1932. [Summary reports on the work done in laboratories during 1932.]—*Ann. des Épiphyties*, xix, 1–2, pp. 1–46, 1933.

These reports from the various phytopathological, entomological, and agricultural research stations in France [cf. *R.A.M.*, xii, p. 75] contain among many others the following items of interest, apart from those already noticed from other sources.

Collar rot of peas associated with *Thielaviopsis basicola* and *Aphanomyces euteiches* [ibid., xii, p. 489] remains prevalent in the Seine-et-Oise, where out of forty-five varieties tested by Labrousse and Marcel some showed both a certain resistance and commercial qualities. Inoculations with *Bacterium* [*Pseudomonas*] *pisi* isolated by Labrousse from Welcome peas [loc. cit.] gave positive results on the Alderman, William the First, Horsford, and Orgueil du Marché varieties. *Bact. medicaginis* var. *phaseolicola* inoculated into 234 varieties of beans [*Phaseolus vulgaris*] gave positive results on only a few [ibid., xi, p. 344].

Not previously reported in France, pear anthracnose (*Elsinoe piri*) [ibid., xi, p. 723] was studied by Arnaud, especially as regards the differences between the lesions caused by it and those produced by *Septoria pyricola* and *Coryneum foliicolum*.

In the vicinity of Bordeaux the meteorological conditions predisposing to widespread attacks of potato blight (*Phytophthora infestans*) [ibid., xii, p. 490] consist, according to Dufrénoy's observations, in the persistence of dew on the leaves for four hours continuously with a temperature over 10° C., and an overcast sky for four-fifths of the following day with a precipitation of at least 0·1 mm. of rain.

Peach leaf curl (*Taphrina deformans*) was controlled by Dufrénoy with 2 per cent. neutral Bordeaux mixture and 6 per cent. anthracene oil [ibid., xi, p. 247; xii, p. 301] emulsified with alkylised sulphonaphthalene applied between November and January.

Small new centres of potato wart disease (*Synchytrium endobioticum*) [ibid., xii, pp. 75, 490] were noted at three localities near Brumath (Bas-Rhin), two at Saint-Amarin (Haut-Rhin), one in the Vosges, and one at Vieux-Condé (Nord).

Tests of the control of apple scab (*Venturia inaequalis*) [ibid., xii, p. 8] in the Clermont-Ferrand region, where it was very severe, showed that a winter spray of Bordeaux mixture and anthracene oil should be applied in March, shortly before the buds burst, that the spray applied between full and late flowering plays

the chief part in protecting the fruit and foliage, that this application must be supplemented by another five weeks later, and, finally, that the application made at the beginning of flowering has very little effect, especially against fruit infection.

A short section deals with the researches of S. Métalnikov of the Pasteur Institute on microbes pathogenic to insects [ibid., viii, p. 309; xiii, p. 30], the preservation of the virulence of the organisms over long periods, and the rapid experimental immunization of the insects. There are also brief special reports on vine and potato diseases.

Faes (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1932.** [Annual report for 1932 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Ann. Agric. de la Suisse*, xxxiv, 8, pp. 919–972, 9 figs., 4 graphs, 1933.

This report contains some brief notes of general phytopathological interest on the occurrence and control of vine and other fruit diseases in the vicinity of Lausanne in 1932 [cf. *R.A.M.*, xii, p. 8].

Uppal (B. N.). **India: plant diseases in the Bombay Presidency.**—*Internat. Bull. of Plant. Protect.*, vii, 8, p. 187, 1933.

Panama disease of bananas [*Fusarium oxysporum cubense*: *R.A.M.*, xii, p. 381] has broken out in a severe form near Poona, the only variety so far affected, however, being that locally known as Son. Infection has been spread to a slight extent by means of suckers from diseased plants, but steps are being taken to prevent further dissemination.

The agent of citrus gummosis in the Bombay Presidency has been determined by S. F. Ashby as *Phytophthora palmivora* [ibid., ix, p. 506].

Leeina philippinensis [ibid., iii, p. 305] (also identified by S. F. Ashby) was isolated from sugar-cane stems grown near Poona.

Narasimhan (M. J.). **Annual Report of the Mycological Section, for the year 1931-32.**—*Admin. Rept. Agric. Dept. Mysore for the year 1931-32*, pp. 32–35, 1933.

During the year ending 30th June, 1932, materials sufficient to spray about 9,400 acres against areca palm [*Areca catechu*] koleroga [*Phytophthora arecae*: *R.A.M.*, xii, p. 76] were sold to the growers at a cost of Rs. 25,449 [approximately £1,908 13*s.* 6*d.*]. *Daedalea*-like sporophores developed in two cultures on moist cotton of pieces of areca stem affected by the 'trunk-splitting' disease [ibid., x, p. 787], the incubation period being about ten months.

The *Helminthosporium* [? *H. nodulosum*: ibid., xi, p. 426] disease of ragi [*Eleusine coracana*] is characterized by brownish spots on the leaves and leaf sheaths and in severe cases by brown lesions on the culm. The fungus sporulates well on most standard media and forms abundant sclerotia on several. The viability of the spores was maintained after a year's storage on the affected grains, for over a week on the husks at a temperature below 10° C., and for the same period of desiccation. Positive results were given

by inoculation tests with aqueous suspensions of the fungus on healthy leaves and stems of *E. coracana* seedlings, which succumbed in about a fortnight and were found to bear numerous spores.

Spraying against *Alternaria* of potato [*A. solani*] with 0·5 per cent. Bordeaux mixture was carried out in about ten villages in the Bangalore and Kolar districts, the first application being given when the crop was 15 to 20 days old and the second a month later.

Su (M. T.). **Report of the Mycologist, Burma, Mandalay for the year ended the 31st March 1933.**—12 pp., 1933.

The foot rot of betel vine [*Piper betle*] caused by *Phytophthora colocasiae* [*R.A.M.*, xii, p. 355] was found to be controllable by monthly applications to the soil of 1 per cent. Bordeaux mixture, or in milder cases by 0·5 per cent. monthly or 1 per cent. every three months.

Of the various organisms associated with the decay of mangosteens [*Garcinia mangostana*], namely *Diplodia natalensis*, *Penicillium*, *Pestalozzia*, and *Pythium* spp., the first-named was responsible for the most extensive infection (12·5 to 100 per cent.) [ibid., xi, p. 62]. The fungus enters the fruit through the rind as well as through the stalk, the main source of infection probably being the dead twigs and young fallen fruits in the plantations.

Tilletia horrida was unusually prevalent on rice [ibid., xi, p. 324] in Mandalay, causing a loss of 2 to 5 per cent. of the grains, especially in the Taungdeikpan variety.

It is stated, in connexion with the green flowering disease of *Sesamum indicum* [ibid., xii, p. 748], that a similar condition in *Justicia gendarussa* has been found to be transmissible by grafting and is therefore probably due to a virus.

Park (M.). **Report on the work of the Mycological Division.**—*Ceylon Administration Reports, Report of the Director of Agric. for 1932*, pp. D 116–D 122, 1933.

Leaf and pod infection of *Hevea* rubber by *Phytophthora palmivora* [*R.A.M.*, xii, p. 77] was slight, owing to the late monsoon of 1932, but the fungus did considerable damage by killing young shoots in bud-wood nurseries and young clearings; nurseries should be sprayed every week during wet weather with a standard fungicide, this treatment having given effective control.

Bunchy top of plantains [loc. cit.] was widespread, and Panama disease (*Fusarium* [*oxysporum*] *cubense*) caused considerable losses in one locality in Colombo District. Successful inoculations were effected with pure cultures of the latter from diseased plants. Field observations and controlled experiments showed that the varieties Mondan, Sona-mondan, Kolikuttu, and Kathemondan (S. Kitala) are relatively susceptible to Panama disease, while Embul hondarawala and Sowandel are relatively resistant.

The tung oil tree (*Aleurites montana*) was attacked by *Fomes lignosus*, *Poria* (? *hypolateritia*), and *Ustulina zonata*, as well as by *Sclerotium rolfsii*, which was found on the lower leaves of young plants; *F. lignosus* also attacked *Croton tiglium*, a leaf and fruit spot of the same host being caused by *Cercospora tiglii*.

Citrus canker (*Pseudomonas citri*) [ibid., xii, p. 433] was ascer-

tained to be extremely dependent on seasonal conditions and to be widespread at all elevations below 3,000 ft.

Inoculations with pure cultures of *Ceratostomella paradoxa* showed that this fungus can cause a disease of coco-nut indistinguishable from the leaf break formerly attributed to a *Botryodiplodia* [ibid., vi, p. 289], as well as an inflorescence disease of areca palms [*Areca catechu*].

The most important tobacco disease was bacterial wilt (*Bacterium solanacearum*), which occurs in all the tobacco-growing areas of Ceylon.

Among the new records for Ceylon were leaf and stem disease of *Passiflora edulis* due to a *Macrosporium* [cf. ibid., x, p. 394], bacterial wilt of parsley (? *Bact. nelliae*), and *Nematospora coryli* in *Phaseolus lunatus* beans.

Smith (F. E. V.). **Plant diseases in Jamaica in 1932. Report of the Government Microbiologist.**—*Ann. Rept. Dept. of Sci. and Agric. Jamaica for the year ended 31st December, 1932*, pp. 13–16, 1933.

Except in the parish of St. Andrew, the increase in the incidence of Panama disease of bananas (*Fusarium cubense*) [*F. oxysporum cubense*: *R.A.M.*, xii, p. 38] was noticeably less in 1932 than in the three foregoing years, amounting only to 26 per cent. compared with 31 per cent. in 1931 and over 100 in 1930 and 1929. The inundation of the plantations by the swollen rivers during the rains is held to be mostly responsible for the majority of fresh infections. The additional losses of banana land from Panama disease in 1932, over the total of 15,660 acres abandoned up to the end of 1931, were estimated at 1,700 acres, and it is expected that by 1940 the effects of the disorder on the export trade will become very noticeable.

Coco-nuts suffered from an outbreak of bud rot [*Phytophthora palmivora*: ibid., viii, pp. 526, 674] in the western end of the Island as a result of the hurricane. The two forms of leaf discoloration—brown and ashen-grey—previously reported [ibid., xii, p. 90] became very apparent in St. Mary and the vicinity, evidently as a sequel to the accumulated physiological disturbances associated with four or five years of abnormal weather. Though obviously related to the 'bronze wilt' of Trinidad, the Jamaican trouble is clearly distinct, no deaths having been reported and rapid recovery occurring with a return to more favourable conditions.

Good control of damping-off (*Rhizoctonia* [*Corticium*] *solani*) among coffee seedlings was obtained by the use of Cheshunt mixture [ibid., i, p. 373], which has also proved effective on a number of other crops.

A Phycomycete believed to be identical with *P. parasitica* was isolated from pineapples infected by a malodorous basal rot [ibid., xi, p. 625].

Leaf mould (*Cladosporium fulvum*) and late blight (*P. infestans*) were unusually prevalent on tomatoes; in the former case preliminary spraying experiments with shirlan and agral [see above, p. 76] gave promising results. Both leaf mould and mosaic were more severe on American than on European tomato varieties.

Dash (J. S.). **Botanical and mycological investigations.**—*Admin. Rept. Dept. Agric. British Guiana for the year 1932*, pp. 30–31, 1933.

The following items of phytopathological interest occur in this report. The sudden wilting of Liberian coffee bushes has been ascertained by Dr. Stahel to be due to phloem necrosis caused by the flagellate *Phytomonas* [*leptovasorum*] which is responsible for serious losses in Surinam [*R.A.M.*, xiii, p. 28]. Generally speaking, the disease is confined to isolated bushes, but in September it was reported to be prevalent over an entire grant in the North West District.

Black eye disease [or fruitlet rot] of pineapples [variously attributed in the West Indies to a *Penicillium* or a bacterium, and elsewhere to *Bacillus ananas* or species of *Penicillium* or *Aspergillus* in association with mites: ibid., vii, pp. 225, 794; x, p. 473] appeared at the New Pineapple Company's cultivation on the Demerara River. No means of control has proved effective in other countries where the disorder is well known.

Dupont (P. R.). **Work connected with insect pests and fungus diseases.**—*Ann. Rept. Dept. of Agric. Seychelles for the year 1932*, pp. 4–5, 1933.

Citrus plants were found to be infected by canker (*Bacterium* [*Pseudomonas*] *citri*. *Rhizoctonia* [*Corticium*] *solani* attacked two of the best cover plants grown in the Seychelles, viz., *Centrosema pubescens* and *Vigna hosei* [*V. oligosperma*: *R.A.M.*, xi, p. 601], but was not observed on *Indigofera endecaphylla* which, for this reason, merits the first place among the introduced cover plants.

Annual Report, Department of Agriculture, Northern Rhodesia, for the year 1932.—27 pp., 1933.

In the section of this report dealing with the work of the Mazabuka Experiment Station, Northern Rhodesia (pp. 9–11), it is stated that three years' seasonal distribution studies showed that the stainers *Dysdercus superstitiosus*, *D. fasciatus*, *D. intermedius*, and, to a less extent, the Pentatomid *Callidea dregei* are concerned in the transmission of cotton internal boll rot [associated with *Nematospora gossypii* and *N. coryli*: *R.A.M.*, xii, p. 438]. *D. superstitiosus* appears in the field when flowering begins and damages the early crop, while *D. fasciatus* appears later and causes the extensive staining of the later crop. *D. intermedius* and *C. dregei* are relatively unimportant. In 1931 62·4 and in 1932 35·4 per cent. of the mature crop was stained.

The only important wild hosts in the cotton-growing area capable of carrying a stainer population are *Thespesia rogersii* and *Adansonia digitata*, of which the former predominates. The normal annual hosts appear to be *Hibiscus* spp., of which by far the most abundant is *H. cannabinus*. In 1932 pure stands of this species occurred over large areas in Northern Rhodesia and from January to June *D. superstitiosus* was present on it in large numbers.

Borg (P.). **Appendix F. Report of the Plant Pathologist.**—*Ann. Rept. on the Working of the Malta Dept. of Agric. during 1932–33*, pp. xiv–xviii, 1933.

Many old citrus trees at Boschetto are suffering severely from a canker which generally begins at an incompletely healed wound and spreads to the heartwood, producing unsightly cavities. Satisfactory results have been obtained on some 90 trees by scooping out the dead tissues and disinfecting the wounds twice, at an interval of a week, after which the cavity is filled with a mixture of cement and fine sand. About 70 orange trees affected by root rot due to *Armillaria mellea* were successfully treated by the excision of the diseased parts and painting the rest of the roots with an iron sulphate solution [*R.A.M.*, vi, p. 102; ix, p. 302], a thin layer of the salt being also spread over the bottom of the excavation surrounding the trees.

An extremely virulent outbreak of potato blight (*Phytophthora infestans*) occurred during a very wet period between 20th and 27th November [ibid., xi, p. 769].

Mattras (H.). **Observations sur les rouilles du Blé faites à Versailles en 1931 et 1932.** [Observations on Wheat rusts made at Versailles in 1931 and 1932.]—*Ann. des Épiphyties*, xviii, 6, pp. 384–397, 1932. [Received November, 1933.]

Further investigations conducted at Versailles from 1930 to 1932 into the effect of meteorological factors, data of sowing, and stage of growth upon the susceptibility of wheat to rusts, estimated chiefly by the method of Ducomet and Foëx [*R.A.M.*, viii, p. 161], showed that *Puccinia glumarum* appeared towards the end of March and early in April, *P. triticina* in June, and *P. graminis* at the end of June and early in July, the periods of heaviest infection for the three rusts being, respectively, in May and June, June and July, and from July or August until harvest time. In general they flourish at temperatures between 10° and 15°, 15° and 22°, and 18° and 25° C., respectively. At 28° to 30° *P. glumarum* ceases to spread, but the other two continue.

It was ascertained that the degree of susceptibility of a given wheat variety to a given rust is not constant for all stages of growth.

Owing to the lateness of its attack on the leaves, *P. triticina* is, on the whole, unimportant agriculturally in France, where *P. glumarum* and *P. graminis*, on the other hand, sometimes cause disastrous losses.

Two years' [tabulated] observations indicated that Hope was the most resistant variety tested, as regards *P. glumarum* and *P. graminis*, followed in descending order by Préparateur Etienne, Warren, Piane 692, Ile de France, K5, P.L.M.*I*, and Providence.

Steiner (H.). **Ueber das Auftreten und die Verbreitung der Getreiderostarten in Oesterreich.** [On the occurrence and distribution of the cereal rust species in Austria.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 488–496, 1933.

The data obtained from a systematic cereal rust survey throughout Austria (1930–2) initiated by the Vienna Institute of Agronomy,

supplemented by the writer's personal observations, indicate that wheat is attacked primarily by *Puccinia triticina* [see preceding and next abstracts], followed by *P. graminis*, while *P. glumarum* is of minor importance, except in the mountains. The principal rust on rye is *P. dispersa* [*P. secalina*], *P. graminis* causing little damage. Barley is mostly infected by *P. simplex* [*P. anomala*], and oats are attacked by *P. coronifera* [*P. lolii*] and *P. graminis*.

STEINER (H.). **Ein Beitrag zur Frage der Ueberwinterung von Puccinia triticina Erikss. und Puccinia dispersa Erikss. und Beobachtungen über die Entwicklung dieser Roste auf ihren Wirtspflanzen.** [A contribution to the problem of the overwintering of *Puccinia triticina* Erikss. and *Puccinia dispersa* Erikss. and observations on the development of these rusts on their host plants.]—*Landw. Jahrb.*, lxxviii, 2, pp. 259–278, 1 diag., 3 graphs, 1933.

Studies on the overwintering of the brown rusts of wheat and rye (*Puccinia triticina* and *P. dispersa* [*P. secalina*]) in Austria were carried out at the Institute of Agronomy, Vienna, from 1930 to 1933 [cf. preceding and next abstracts].

Germination tests made in December, January, and March showed that the uredospores of both the rusts were still partially viable at these times (to an average extent of 20 per cent.) [cf. *R.A.M.*, xii, p. 16]. The number of uredo pustules that develop in the early spring is considerably less than in the autumn, largely owing to the desiccation of the lower leaves which are primarily infected. Planting experiments in 1931–2 with several wheat and rye varieties indicated the possibility of mycelial overwintering in both rusts. In the autumn the infection on rye was considerably heavier than on wheat, pustule formation being also more profuse on the former.

Evidence was forthcoming for the occurrence of so-called 'phases of latency' in the rusts coinciding with certain stages of development in the host. Thus, during the period between the germination of the autumn-sown seed and stem development, uredo pustules are practically absent. Pustule formation begins with stem development and continues throughout the growing period. A second phase of latency occurs in the development of the rusts in the early spring, beginning shortly before tillering and ending soon after on the lower leaves, while on the upper ones it is prolonged until after flowering. After the harvests the rusts can survive in the uredo stage on plant refuse left in the field, as well as on volunteer plants, until the germination of the autumn seed [cf. ibid., v, p. 724].

STEINER (H.). **Ein Beitrag zur Frage des Einflusses verschiedener Bodenfeuchtigkeit auf den Befall (Infektionstypus) des Weizens mit Puccinia triticina Erikss.** [A contribution to the question of the influence of differing soil moisture on the attack (type of infection) of Wheat by *Puccinia triticina* Erikss.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 484–487, 1933.

Apart from some minor modifications, no alteration could be

induced in the type of infection resulting from uredospore inoculations of *Puccinia triticina* [see preceding and next abstracts] at the Vienna Institute of Agronomy on a number of wheat varieties by varying the soil moisture between 20, 40, 60, and 80 per cent. of the water-holding capacity of the soil. This does not agree with A. Volk's results with *P. dispersa* [*P. secalina*] on rye [*R.A.M.*, x, p. 479].

SCHILCHER (R.). **Beitrag zur Rostfrage.** [A contribution to the rust problem.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8-9, pp. 533–563, 4 graphs, 1933.

Following a brief survey of the principal contemporary literature on the cereal rusts (*Puccinia* spp.) with special reference to the problem of physiologic strains and biotypes, the writer fully describes his experiments (1929–32) at the Vienna Plant Protection Institute on the control of brown rust of wheat (*P. triticina*) [see preceding abstracts].

In order to examine the possibilities of combating the disease by chemical methods, the plants were sprayed once to three times between the beginning of May and early June, 1929, with 1 per cent. Bordeaux mixture, other plots being dusted with unoiled calcium cyanamide in amounts up to 1 kg. per 100 sq. m. While the former treatment proved quite ineffectual, some benefit was derived from the latter, though accompanied by burning of the leaves [*R.A.M.*, x, p. 88]. No apparent influence on the course of infection was exerted in 1929 by the depth or density of sowing or the time of planting. Potash and phosphorus fertilizers were found to reduce the incidence of rust, which was promoted, on the other hand, by nitrogenous ones [ibid., xi, p. 98]. In the three following years the experiments were extended to include 25 wheat varieties and two other localities, the influence of weather conditions being carefully observed. The time, severity, and nature of the rust attacks were found to be dependent especially on the weather conditions prevailing during April to June and in the preceding autumn. In the course of the trials it was observed that *P. triticina*, in contrast to *P. glumarum*, is not adversely affected by a sudden rise in temperature [cf. ibid., xii, p. 557]. The only physiologic forms of *P. triticina* hitherto isolated in Austria are XIII, XIV, XV, and XXI [ibid., xii, p. 619].

HEMMI (T.) & ABE (T.). **On the relation of air humidity to germination of urediniospores of some species of Puccinia parasitic on cereals.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 1–9, 1933.

A tabulated account is given of the writers' studies on the influence of relative atmospheric humidity on the germinability of the uredospores of *Puccinia glumarum* and *P. triticina* from wheat and of *P. lolii* from oats [*R.A.M.*, x, p. 587] at Kyoto, Japan.

The uredospores of *P. triticina* germinated profusely in a saturated atmosphere or in a drop of precipitated moisture, whereas only 4·27 per cent. of the dry uredospores exposed to 99 per cent. humidity germinated, and it is doubtful whether any germination

occurred at 95 per cent. The percentage of germinating uredospores of *P. glumarum* in a saturated atmosphere was low (12 per cent.) compared with the figure (44·5 per cent.) obtained in drops of water. At 99 per cent. humidity the germinability of the uredospores of this species averaged 1·5 per cent. The germination percentages for the uredospores of *P. lolii* in water drops, a saturated atmosphere, and at 99 per cent. humidity were 50·1, 34·9, and 16·8, respectively. Neither *P. glumarum* nor *P. lolii* was able to germinate at or below 95 per cent. relative humidity. Microscopical examination after 24 hours of all the spores germinating at 100 or 99 per cent. humidity revealed the presence of a thin surrounding film of water, which was not formed at 95 or 90 per cent. This observation is considered to substantiate the opinion of Beauverie [ibid., iv, p. 154], Melhus and Durrell (*Iowa Agric. Exper. Stat. Res. Bull.* 49, 1919), and others that direct contact with water is essential to uredospore germination in the cereal rusts.

Lindfors (T.). **Kampen mot Berberisbusken och nödvändigheten av skärpt lagstiftning.** [The campaign against the Barberry bush and the necessity of drastic legislation.]—*Kungl. Landtbruks-Akad. Handl. och Tidskr., 1933*, 4, pp. 441–450, 1933.

The writer traces the history of the barberry eradication campaign against black rust of cereals [*Puccinia graminis*] in Sweden and urges the necessity of more drastic legislation, in particular as regards the elimination of the 200 m. radius clause [see next abstract].

On pp. 450–452 A. von Bergen describes the organization of the campaign in the Södermanland province, the costs of which in 1931 and 1932 are analysed as follows: sodium chlorate Kr. 30,527, salt [illegible] labour [illegible] apparatus 7,000, and miscellaneous 27,269 : 71, making a total of Kr. 241,243 : 68 (not including the purely investigational expenses).

Lindfors (T.). **Utrotning av Berberisbusken.** [The eradication of the Barberry bush.]—*Statens Växtskyddsanst. Flygbl.* 5, 5 pp., 1 col. pl., 1933.

A popular account is given of the part played by the barberry in the dissemination of black rust of cereals [*Puccinia graminis*] in Sweden, together with full directions for its eradication by spreading common salt round the bushes or spraying them with 7 to 8 per cent. sodium chlorate [*R.A.M.*, ix, p. 705 ; x, p. 589]. A note is added on a new amendment (26th May, 1933) to the barberry eradication law of 1918 [ibid., vi, p. 21], by which the regulations now in force in a number of districts are made to apply to other *Berberis* varieties as well as *B. vulgaris* irrespective of their distance from cultivated land, which was formerly fixed at 200 m. [see preceding abstract].

Clark (J. A.) & Humphrey (H. B.). **Inheritance of stem-rust reaction in Wheat.**—*Journ. Amer. Soc. Agron.*, xxv, 8, pp. 497–511, 3 graphs, 1933.

A tabulated account is given of the writers' studies on the

inheritance of stem [black] rust (*Puccinia graminis*) reactions in wheat hybrids. Three groups of reactions are recognized, viz., near immunity, resistance, and susceptibility. Earlier data on crosses of Hope × Marquis and Hope × Reliance were interpreted to show that the rust reaction in these wheats is controlled by two genetic factor pairs, and similar results were later obtained from an H–44 × Ceres cross. The outcome of the investigations is considered to denote that Hope has a single dominant inhibiting factor for near immunity [*R.A.M.*, vii, p. 433], Marquis and Reliance have a dominant factor for susceptibility, H–44 carries both these dominant factors, and the resistant Ceres carries the double recessives.

Voss (J.). **Gelbrostwiderstandsfähigkeit als Sorteneigenschaft beim Weizen.** [Resistance to yellow rust as a varietal character of wheat.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 9, pp. 73–74, 1933.

This is an explanatory note on W. Straib's recent studies in connexion with the varietal reaction to certain physiologic forms of wheat yellow rust (*Puccinia glumarum*) in Germany [*R.A.M.*, xii, p. 557], with particular reference to the commercial varieties of wheat included in the groups recognized by Straib. The writer's researches on the synonymy and relationships of the various commercially named wheats are considered to have been confirmed by these studies of their reaction to the rust.

Smith (W. K.). **Inheritance of reaction of Wheat to physiologic forms of Tilletia levis and T. tritici.**—*Journ. Agric. Res.*, xlvii, 2, pp. 89–105, 2 graphs, 1933.

In the experiments described in this paper the author studied the inheritance of resistance to physiologic forms T1, T2, and T3 of *Tilletia tritici* [*T. caries*] and L4 and L5 of *T. levis* [*T. foetens*: *R.A.M.*, xii, p. 618] in crosses between the Hope and Jenkin spring wheats, the first of which is highly resistant to all five forms when sown in the spring but susceptible in autumn sowings, while the second is always susceptible [cf. ibid., xi, p. 705]. The results [which are statistically discussed] of inoculations of the F_3 generation of the crosses indicated that in Hope the factors for resistance to any one of the five bunt forms seem to be the same as those for resistance to any of the others, a satisfactory explanation being offered by the assumption of the existence in this variety of three main factors for resistance, with no indication of the dominance of either resistance or susceptibility.

Hope was also crossed with the winter wheats White Odessa and Ridit, and the F_3 generations were tested for resistance to physiologic form L4 of *T. foetens*, to which White Odessa is moderately and Ridit highly resistant. In the portion of the F_3 generation which was sown in the spring scarcely a trace of bunt showed, indicating that both winter wheats carry at least some of the same factors as Hope for resistance to L4 in spring sowing. In the portion that was sown in the autumn, however, the results did not allow of determining the number of factors for reaction to L4 in the Hope × White Odessa cross, but there was some evidence that

the reaction of Hope to this form, in autumn sowing, differs from that of Ridit by one single main factor. No evidence was obtained in the three crosses discussed of a linkage between the factor or factors for reaction to bunt and the factors for length of awn, colour of glume, and winter or spring habit of growth.

Flor (H. H.). **Studies on physiologic specialization in Tilletia tritici and T. levis in the Pacific North-west.**—*Journ. Agric. Res.*, xlvii, 4, pp. 193–213, 5 figs., 1 map, 1933.

The results of a survey in 1929 and 1930, during which bunt was collected from 182 fields in the principal wheat-growing areas in Oregon, Washington, and northern Idaho, showed that *Tilletia tritici* [*T. caries*] was present in every collection, while *T. levis* [*T. foetens*] was found in only 60 per cent. of the total number of cases investigated. Numerically *T. foetens* predominated over *T. caries* to the west of the Cascade Mountains, while to the east this was reversed. Pathogenicity tests indicated that the collections contained at least seven physiologic forms of *T. caries* and six of *T. foetens* [see preceding abstract]. Some collections exhibited transitional pathogenicity characters, indicating that they either consisted of a mixture of different forms or were a result of hybridization between two forms [*R.A.M.*, xi, p. 440]. The great majority of the collections (84 per cent.) only comprised the less virulent physiologic forms of *T. caries* and *T. foetens*, but while most of the new virulent forms were obtained chiefly from fields of the resistant Albit and Ridit wheat varieties, they were also found in a few collections from susceptible varieties in widely scattered localities.

Special tests showed that while pathogenically distinct forms of bunt were easily separated by the 'screening' [purifying] effect of resistant wheat varieties, breeding of a given form on such a host (Hussar) for several years did not increase its pathogenicity to that or other varieties.

Cultural studies of the various bunt collections indicated that morphological variations, e.g., in size, colour, character of reticulation of the spore wall, &c., are heritable, but gave no indication of a definite correlation between these characters and pathogenicity. It was also shown that in some instances the morphological characters of two monosporidial cultures, one of *T. caries* and one of *T. foetens*, resembled one another more closely than did two monosporidial cultures of one and the same physiologic form of either species. Temperature during the period of infection did not appear to be a significant factor in the percentage of bunt caused by five distinct physiologic forms tested. No correlation was observed between the cultural characteristics and pathogenicity of the forms, except that non-chromogenic cultures of *T. foetens* invariably belonged to the less pathogenic forms.

Vassilievsky (A.). Техника проращивания спор **Tilletia tritici Wint.** [A method for the germination of the spores of *Tilletia tritici* Wint.]—*Советская Ботаника* [*Botany of the Soviets*], *1933*, Leningrad, 2, p. 97, 1933. [German summary.]

The author states that the method which proved the most satisfactory in germination tests of *Tilletia tritici* [*T. caries*] spores

was to place a drop of a water suspension of the spores on the bottom of a sterilized Petri dish or on a glass slide inside the dish, flatten out the drop as much as possible by shaking the dish or the slide, cover the drop with a small loose cotton-wool wad (about 1 sq. cm.), loosely cover the Petri dish so as to ensure sufficient circulation of air, and incubate the whole preparation at 16° to 18° C. The count of the germinated spores is made on the fifth or sixth day, the spores being clearly visible through the cotton fibres, or the wad may be carefully removed, first moistening it with a drop or two of sterilized water. The method is stated to have given germinations averaging over 70 per cent. of the spores, some of which were seen bearing well-developed clusters of basidiospores.

Eckhoff (G.). **Beizversuch zu Winterweizen.** [Disinfection test with winter Wheat.]—*Ratschläge für Haus, Garten, Feld*, viii, 9, pp. 139–141, 1933.

Absolute control of wheat bunt [*Tilletia caries* and *T. foetens*] was given in a recent German experiment by dusting with ceresan, 30 minutes' immersion of the seed-grain in a 0·125 per cent. solution of the same preparation, the short disinfection process with 2 per cent. ceresan, and sprinkling with a 0·5 per cent. solution. In the untreated control plots there was 46·5 per cent. complete infection of the ears, corresponding to an average loss of 7·5 cwt. of wheat per ¼ hect. The average cost of the treatment was about Pf. 50 per acre [cf. *R.A.M.*, xii, p. 152].

Lindfors (T.). **Korta anvisningar rörande utsädesbetning.** [Brief directions for seed-grain disinfection].—*Statens Växtskyddsanst. Flygbl.* 2, 6 pp., 4 figs., 1933.

Directions are given in popular terms for the disinfection of cereal seed-grain against some common fungous diseases in Sweden [*R.A.M.*, xi, p. 568].

Samuel (G.) & Garrett (S. D.). **Ascospore discharge in Ophiobolus graminis, and its probable relation to the development of whiteheads in Wheat.**—*Phytopath.*, xxiii, 9, pp. 721–728, 1933.

The writers have recently observed that during rainy periods in South Australia the ascospores of *Ophiobolus graminis* may be ejected from the perithecia into the air at the rate of several hundred per minute from a single diseased wheat culm. Fields severely infected with whiteheads were found to contain a number of small patches in which the seedlings had been killed by take-all and bore perithecia. The disease is most prevalent on newly cleared *Eucalyptus* scrub land, which is at first continuously cropped with wheat. It usually shows up on the second or third crop and continues until the farms are brought into full cultivation and suitable practices of crop rotation and the like have been adopted. The older wheat-growing regions with established rotations are comparatively free from take-all.

Three main factors appear to be concerned in the epidemiology of take-all, namely, lack of consolidation of the soil, the presence of some inoculum in the soil, and the persistence of showery

weather almost until heading. The heaviest losses from take-all are due to the development of whiteheads just before the crop ripens, at which stage 80 per cent. of the grain of a fine crop may be suddenly destroyed. In 1932, when weather conditions favoured the growth of the fungus, several million bushels of wheat were lost as a result of the disease in South Australia.

Discussing in some detail the above-mentioned three factors predisposing to infection by *O. graminis*, the writers point out that most of the diseased crops are on soils of a light, sandy texture, though attacks may also be induced on heavier soils by unduly deep ploughing or ploughing in pasture grasses. Little is known about the distribution and concentration of take-all inoculum in the soil, but it seems highly probable that the scattered patches of seedling infection are due to localized soil contamination with the fungus. Epidemics of take-all are then liable to occur when there is showery weather leading to ascospore discharge from these early infections during the growing period ; conversely, in seasons with a fine, dry spring the incidence of the destructive whitehead phase of the disease is low.

Under laboratory conditions ascospore discharge usually began 10 to 30 minutes after moistening the fragments of leaf sheaths bearing perithecia, each of which ejected asci at the rate of 2 to 10 per minute for one to two hours. A piece of tissue about $\frac{1}{8}$ in. sq. bearing six perithecia ejected spores at the rate of over 100 per minute for more than an hour. The same method of spore ejection was observed in the field on perithecia-bearing culms moistened with rain water. As they are discharged, the ascospores may be carried away by air currents. Since the asci in the perithecia of *O. graminis* do not all ripen simultaneously, ascospore discharge probably takes place from the same perithecium several times in succession during a rainy season. The longevity of the ascospores was found to extend from three or four days under dry conditions to a week in a humid atmosphere at 12° C., the approximate mean temperature in the field during a wet spring.

SCHADE. **Aus der Praxis der Genossenschaftsbeizung.** [A note on co-operative disinfection in practice.]—*Nachricht. über Schadlingsbekämpf.*, viii, 3, pp. 118-120, 1933.

In the Wurzen [Saxony] agricultural co-operative district, covering an area of some 20,000 hect., the occurrence of heavy infection by wheat bunt [*Tilletia caries* and *T. levis*], *Fusarium* of rye, barley stripe [*Helminthosporium gramineum*], or loose smut of oats [*Ustilago avenae*] is stated to be quite exceptional. The virtually complete control of these diseases is attributed to the joint efforts of the co-operative agricultural union and the experimental 'ring' during the past ten years [cf. *R.A.M.*, xi, p. 36]. The proportion of treated seed-grain increased from 50 per cent. in 1927 to 84 per cent. in 1932. The disinfection is carried out with a Neuhaus-Eberswalde dusting machine [ibid., xii, p. 430] and (since 1930) with a short disinfection apparatus. Nearly all the 1,000 members of the co-operative union make use of these facilities with the above-mentioned excellent results. In two cases of severe bunt infection investigated in 1932 the causes were found to lie in failure

to procure clean seed for the last few years and in the use of the wholly unreliable sprinkling treatment.

Obertreis. **Die Bekämpfung der Streifenkrankheit der Braugerste.** [The control of stripe disease of malting Barley.]—*Nachricht. über Schädlingsbekämpf.*, viii, 3, pp. 121–124, 1 fig., 1933.

Very promising results have been obtained of recent years in the Rhine Province by the treatment of barley seed-grain against stripe disease (*Helminthosporium gramineum*) with ceresan [*R.A.M.*, xii, p. 16], and a concerted effort is being made by the co-operative agricultural-experimental 'ring' [cf. preceding abstract] to introduce routine disinfection by this method through the local breweries.

Muskett (A. E.) & Cairns (H.). **The effect of seed disinfection upon the Oat crop.**—*Journ. Min. Agric. Northern Ireland*, iv, pp. 105–115, 1933.

The salient features of this tabulated account of the writers' three years' experiments in Northern Ireland on the disinfection of oat seed-grain against the loose and covered smuts (*Ustilago avenae* and *U. kolleri*) have already been summarized from another source [*R.A.M.*, xii, p. 211]. It is claimed by G. O'Brien and E. G. Prentice that the improvement in the condition of oat crops treated with organic mercury compounds in Scotland is due to the control of leaf stripe (*Helminthosporium avenae*) [ibid., ix, p. 771], but the writers' observations in Ireland suggest that these compounds act as general disinfectants during the early stages of germination, *H. avenae* being only one of the injurious factors which they eliminate.

Piacco (R.). **Ipertrofia ed anomalie dell' infiorescenza maschile del Mais causata dal carbone.** [Hypertrophy and anomalies of the male inflorescence of Maize caused by smut.]—*Giorn. di Risicolt.*, xxiii, 8, pp. 177–181, 3 figs., 1933.

A note is given on the hypertrophy and other abnormalities of the male inflorescences of maize produced in Italy by smut (*Ustilago maydis*) [*U. zeae*: *R.A.M.*, xii, p. 563].

Müller (A. S.). **Observations and notes on Citrus diseases in Minas Geraes, Brazil.**—*Phytopath.*, xxiii, 9, pp. 734–737, 1933.

Notes are given on the following diseases affecting the newly established citrus plantations in Minas Geraes, Brazil. Sweet oranges and grapefruit are liable to a gum disease resembling mal di gomma. At the Agricultural College, a similar disease caused 31 and 19 per cent. infection, respectively, in two blocks of 600 and 1,000 one-year-old Rangpur lime seedlings. In 1931 the percentages of infection on rough lemon, Rangpur lime, sweet orange, shaddock [thick-skinned pomelo], and sour orange [*Citrus aurantium* var. *bigaradia*] stocks were 29, 26, 26, 17, and 19, respectively, the corresponding figures for 1932 being 23, 19, 19, 11, and 6. A species of *Phytophthora*, probably *P. parasitica* [*R.A.M.*, xii, p. 212], was isolated from a number of the affected seedlings.

A species of *Fusarium* was observed spreading as a thin, whitish

web over the upper, partly or wholly exposed roots of tangerine trees, the infection extending to the base of the trunk. The perithecia of a *Nectria* were also found in profusion in the cracks of infected bark, which readily shreds off. Possibly the disease is a form of dry root rot.

Damping-off of Rangpur lime and rough lemon seedlings, associated with species of *Fusarium* and *Pythium*, caused losses in two consecutive years in Vicosa of 15 and 5 per cent.

Scab [*Sporotrichum citri* or *Sphaceloma fawcettii*: ibid., xii, p. 689] may be regarded as a major disease, causing moderate to heavy infection of the Genoa, rough, and sweet lemons, King tangerine, West Indian and Rangpur limes, and bitter-sweet oranges (100 per cent. on the two last-named) in nursery rows; no mature Rangpur lime has been seen without severe scab on the leaves, twigs, and fruit.

Melanose [*Diaporthe citri*: ibid., xiii, p. 26] occurs mostly in old, closely planted seedling orange patches, and was also found on Marfim lemons.

Several distinct forms of *Colletotrichum gloeosporioides* appear to be associated with a mild type of anthracnose on grapefruit, shaddock, Rangpur lime, sweet orange, and sweet and Genoa lemons, the leaves, twigs, buds, flowers, and fruit being involved.

Septobasidium albidum [ibid., x, p. 654] is very difficult to remove from the peduncle end of the fruit in packing. An apparently different species of *Septobasidium*, not necessarily connected with insects, forms thin, brownish-red plates on the fruit, twigs, and leaves, which it may bind together.

A leaf spot associated with a *Phyllosticta*, resembling *P. hesperidearum*, has been observed on old, neglected orange trees, while *Ascochyta citri* has been found on seedling grapefruit, causing spotting, yellowing, and dropping of the leaves.

Aspergillus niger, *Alternaria* sp. on Satsuma oranges [*Citrus nobilis* var. *unshiu*] and lemons, and a species of *Fusarium* on limes are minor agents of fruit rot, the chief causes of which in Minas Geraes are *Penicillium italicum*, *P. digitatum*, and *Oospora citri-aurantii*.

Scale insects of citrus are parasitized throughout the year by *Cephalosporium lecanii* [ibid., ix, p. 33], *Tuberculatia coccicola*, *Myriangium duriaei* [ibid., vi, p. 419], *Podonectria* sp., and *Microcera* sp. [ibid., x, p. 554].

Fawcett (H. S.). **New information on psorosis or scaly bark of Citrus.**—*California Citrograph*, xviii, 12, p. 326, 1933.

A hitherto unrecognized symptom associated with psorosis of citrus [*R.A.M.*, xii, p. 89] in California was observed in May, 1932, namely, a mosaic-like spotting of the foliage. Taken in conjunction with the data from budding experiments and other observations, this discovery suggests that the disease may be partially or entirely due to a virus. Small, light-coloured areas develop on very young, rapidly growing leaves, chiefly near the smallest veinlets, of which and of the adjacent tissue there appears to be a clearing. The stippled effect disappears as the leaves reach maturity, to be replaced in some cases by clear, approximately circular spots

with raised corky pustules or rings at the centre. A series of 23 ten-year-old Valencia orange trees, propagated from buds off psorosis-infected branches, all show mosaic symptoms on the leaves, accompanied in 14 by the typical features of the disease on the bark. No mosaic symptoms have developed, on the other hand, on the leaves of 11 trees budded at the same time from healthy individuals, and only one shows a single bark lesion.

Casella (D.). **Un tumore prodotto da Bacterium tumefaciens Smith e Town. su Arancia ovale e la selezione gemmaria.** [A tumour caused by *Bacterium tumefaciens* Smith & Towns. on an oval Orange, and bud selection.]—*Ann. R. Staz. Sper. di Fruttic. e di Agrumic.*, Acireale, N.S., i, pp. 43–45, 1 pl., 1933.

A green, irregularly warted lateral outgrowth [shown in the photograph reproduced to be rather more than half the diameter of the fruit in length], which was seen by the author on an otherwise entirely normal, orange-yellow, smooth-skinned oval orange from Calabria, was found in longitudinal section to have been caused by the proliferation, attributed to the action of *Bacterium tumefaciens*, of the mesocarp, and to consist internally of a white, spongy parenchyma with round or fusiform cells, traversed by numerous fibro-vascular bundles sparsely lignified and anastomosing; on the outside it was covered with a pericarp identical with that of the fruit itself. So far as he is aware, this is the first record of a crown gall tumour on citrus fruits, apart from a recent description by P. C. Shamel (*U.S. Dept. of Agric. Tech. Bull.* 123, 1929) of what is believed to have been an identical formation on a Washington navel orange, but which was interpreted by Shamel as a bud variation.

Benton (J.) & Powell (T. N.). **Removing Bordeaux spray from Oranges. Immersion in hydrochloric acid proved efficient and economical.**—*Agric. Gaz. New South Wales*, xliv, 9, pp. 683–684, 1933.

The Bordeaux oil spray (6–4–80–½) commonly applied for the control of black spot of Valencia oranges [*Phoma citricarpa*: *R.A.M.*, xi, p. 450] in New South Wales was found to be readily removable by 30 seconds' immersion of the fruit in ⅛ to 2 per cent. hydrochloric acid, the latter strength also being efficacious in 7½ seconds. No sign of injury to the fruit so treated was apparent after three weeks' storage, and a very bright colour characterized them. No further advantage was derived from additional dippings in 1 per cent. sodium chloride or sodium sulphate, the latter in fact tending to dull the vivid colour of the acid-treated fruit. The commercial hydrochloric acid costs 5*s.* to 6*s.* per gall. and is diluted 2¼ pints in 10 galls. water to give a 1 per cent. solution.

Streets (R. B.). **Heart rot of the Date Palm.**—*Arizona Agric. Exper. Stat. Tech. Bull.* 48, pp. 413–469, 10 pl., 4 figs., 1933.

A full account is given of a previously undescribed heart rot of the date palm (*Phoenix dactylifera*) observed by the author in the Yuma Valley district of Arizona and California in 1925 and

ascertained to be due to *Thielaviopsis* [*Ceratostomella*] *paradoxa* [cf. *R.A.M.*, xi, p. 509]. The same disease was also found on *P. canariensis*, *Washingtonia filifera*, and *Erythea edulis*, and it probably attacks other species of palms [ibid., vi, p. 144; viii, p. 563].

The affected trees first showed a retarded development of the new leaves which made the crown appear as if flattened; the individual pinnae died out progressively towards the midrib, the older leaves being attacked first. Soon all the foliage became affected and the palms rapidly succumbed. The most conspicuous symptoms were present in the trunk, where the affected areas passed progressively through various shades of yellow and brown until they became almost black. The pith was completely disintegrated, but the vascular bundles were not noticeably affected.

Only trees previously weakened were attacked, those most susceptible being palms whose normal crown of leaves had been removed or greatly reduced in efforts to eradicate scale insects, without any corresponding reduction in the water supply to the roots. The fungus usually passed into the tree through the roots, the trunk being entered near soil level; sometimes entry was effected through wounds caused by mechanical injuries or through injuries made in removing offshoots from the base of the palm near soil level. Weakened trees died a few days after the disease became apparent, but in vigorous or resistant palms infection frequently became arrested.

Control depends on the destruction of all diseased palms and on improved cultural and sanitary methods. The disease is not a serious menace to well-managed orchards.

A bibliography of 31 titles is appended.

Neal (D. C.), Webster (R. E.), & Gunn (K. C.). **Growth of the Cotton root-rot fungus in synthetic media, and the toxic effect of ammonia on the fungus.**—*Journ. Agric. Res.*, xlvii, 2, pp. 107–118, 2 pl., 3 figs., 1 graph, 1933.

The results of the experiments reported in this paper showed that the cotton root rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xii, p. 691] made abundant growth in synthetic media containing calcium, sodium, or potassium nitrates as a source of nitrogen, while in the presence of equivalent doses of ammonium nitrate or ammonium sulphate, very little growth appeared at the end of 11, 18, and 31 days, respectively. The apparent toxic effect of ammonia on the fungus was confirmed in tests, in which the mycelium was killed after 20 minutes' exposure to ammonium hydroxide at a concentration as low as 500 parts per million, and by exposure for 30 seconds to the gas liberated from a 28 per cent. solution of ammonia in water. The latter also inhibited germination of *P. omnivorum* sclerotia after exposures as short as 10, 15, and 20 seconds, and the sclerotia were killed in 5 minutes by a 1 per cent. solution of ammonium hydroxide. In field tests a 6 per cent. solution of ammonium hydroxide applied to the soil around the roots of infected adult cotton plants killed the mycelium in most cases, without appreciable damage to the host, but the latter suffered severely from the effect of an 8 per. cent. solution.

The paper terminates with a brief discussion of the bearing of these findings on the possibility of controlling the disease by continued applications of barnyard manure or of ammonia or ammonium compounds, and also of protecting ornamental plants against attacks by the fungus in a similar manner.

ESTIFEYEFF (P. G.). К материалам по изучению болезни „корневая" гниль в условиях Средней Азии. [Contribution to the study of 'root rot' of Cotton under Central Asiatic conditions.] —39 pp., 19 figs., Scient. Res. Inst. for Cotton Growing and for the Cotton Industry, Scient. Ser., Tashkent, 1930.

This is a detailed report of the author's preliminary investigation of a damping-off of cotton seedlings, chiefly at the two-leaf stage, which is stated to be very prevalent in certain seasons over the whole of Russian Central Asia. The results disproved Zaprometoff's statement [*R.A.M.*, vii, p. 374] that this condition, which was described by him under the name 'root rot', is due to mechanical injury to the collar and stem of the seedlings, followed by invasion by certain saprophytes, or is caused by *Rhizoctonia crocorum* [*Helicobasidium purpureum*], the last-named fungus never having been found in diseased material. The term 'root rot' is also misleading, since in by far the greater part of the affected seedlings examined, the root system remained healthy, the chief symptom consisting in the development of dry cankers on the collar of the stems, which were more or less completely girdled, the death of the plants being caused by the destruction of the cortical tissues. The lesions were never seen to penetrate the xylem, which showed no discoloration. The term collar necrosis is considered to be more descriptive of the condition. Cotton seedlings beyond the two-leaf stage appear to be more resistant to the disease, and a fair proportion of those attacked were observed to recover.

The condition was found to be caused by a number of parasites, the most frequent among which (114 out of 218 cases investigated) was *Moniliopsis aderholdi*, which is very widespread in Central Asia, where it has been recorded on *Hibiscus esculentus*, *H. cannabinus*, *Abutilon avicennae* [ibid., xi, p. 183], and groundnut. Mites and insects were found to further the attack by this fungus, a full description of which is given, followed by an English diagnosis. Next in frequency of incidence (70 out of 218) were *Fusarium vasinfectum* [ibid., xi, p. 316], *F. buharicum* [ibid., ix, p. 380], and other species of this genus, while an undetermined species of *Verticillium* was found in 16 cases, causing collar cankers of a somewhat lighter colour than those induced by *M. aderholdi*.

PAILLOT (A.). **L'infection chez les insectes. Immunité et symbiose.** [Infection among insects. Immunity and symbiosis.]—535 pp., 279 figs., Trévoux, 1933.

This book, which contains many original illustrations, is divided into seven parts, of which the first four deal with the diseases caused by protozoa, fungi, viruses, and bacteria; the fifth with antibacterial immunity; the sixth with the phenomenon of bacterial symbiosis in aphids; while the seventh sets forth all the economic consequences of the investigation of infectious pathology among

insects, with special reference to the role of the latter in the transmission of infective agents and to the utilization of microbial parasites in the campaign against agricultural pests [see above, p. 77].

NATTRASS (R. M.). **Preliminary notes on some entomogenous fungi in Egypt.**—*Tech. & Sci. Service (Bot. Sect.) Min. of Agric., Egypt. Bull.* 120, 9 pp., 6 pl. [3 col.], 1932. [Received August, 1933.]

Notes are given on the following entomogenous fungi observed in Egypt: an organism identical with, or closely allied to, *Empusa grylli* [*R.A.M.*, viii, p. 380] on *Euprepocnemis plorans*, an *Empusa* with smaller conidia on *Prodenia litura*, *Aspergillus flavus* (group species) on *Pseudococcus sacchari*, *Beauveria bassiana* [ibid., xi, p. 299] on *Anacridium aegyptium*, and the small-spored strain of *Metarrhizium anisopliae* [ibid., xi, p. 782] as well as an undetermined *Mucor* on *Anacridium* (*Orthacanthacris*) *aegyptium*.

AVERNA-SACCÁ (R.). **Um entomophago cryptogamico do Caconema radicicola (Greef) Cobb (Fusarium mauroi n. sp.).** [A cryptogamic entomophage of *Caconema radicicola* (Greef) Cobb (*Fusarium mauroi* n. sp.).]—*Rev. Agric.*, [Brazil], viii, 3–4, pp. 93–101, 4 pl., 1933.

The eggs, larvae, and adults of *Caconema* [*Heterodera*] *radicicola* [*H. marioni*] parasitizing the root system of coffee and other plants in Brazil were found to be attacked by a species of *Fusarium* considered to be new and named *F. mauroi*. The fungus is characterized on potato, bread, or carrot agar at 25° C. by circular, white or faintly ashen, cottony or powdery colonies. The hyphal cells are 96 to 111 μ long by 3·5 to 4·5 μ broad. The falcate or clavate, occasionally straight, 1- to 5-septate conidia, measuring 29·6 to 62 by 4·8 to 9·3 μ, are borne at the tips of short conidiophores, with broad bases but tapering towards the apices, produced in clusters on the hyphae. Continuous, oval or elliptical microconidia, 8 to 22·2 by 3·2 to 5 μ in diameter were also produced. After 14 days on potato agar obclavate, conical, or cylindrical sporodochia were formed, the conidia from which measured 118 to 134·5 by 11 to 12·8 μ and had 6 to 10 (generally 8) septa. Concentric zones of alternating pale yellow and pink develop in colonies on nutrient agar. Sporodochia failed to form in carrot agar cultures kept in darkness.

CHIAPPELLI (R.). **Indagini sperimentali sulle cause d'infezione di dermatomicosi saprolegniacea nella Carpa.** [Experimental studies on the cause of infection by saprolegniaceous dermatomycosis in the Carp.]—*Giorn. di Risicolt.*, xxiii, 8, pp. 169–173, 2 figs., 1933.

Extensive damage is stated to be caused to carp in Italy by a fungus belonging to the Saprolegniaceae, and the writer makes some recommendations for the avoidance of the disease by strict attention to the sanitation of the basins and suitable methods of rearing. Disinfection of the fish with permanganate of potassium (1 in 200,000 for 20 minutes) gave promising results on a small scale.

TAKAHASHI (S.). **Experimentelle Untersuchungen über Coccidioides immitis.** [Experimental investigations on *Coccidioides immitis*.]—*Arch. für Dermatol.*, clxviii, 3, pp. 597–610, 6 figs. (1 col.), 1933.

A full account is given of the writer's inoculation experiments with *Coccidioides immitis* [*R.A.M.*, xii, p. 692] on guinea-pigs at Sapporo, Japan, and of his morphological studies on the fungus.

The sites most commonly attacked were found to be the liver, pancreas, genital region, lymphatic glands, lungs, and spleen. The fungus was readily identified in the tissues by a modified carbol fuchsin-methylene blue staining method. On artificial media *C. immitis* forms intercalary or terminal, thick-walled, globular, mostly septate chlamydospores, 5 to 20 μ in diameter; on subculturing, these bodies produce a mycelium and a mycelium also developed from the germinating 'endospores' occupying the asci, a new observation so far as the writer is aware [but see ibid., xii, p. 170]. Of the three kinds of double-contoured structures observed in the animal body, only the endospores remain in the later stages of the disease.

MOORE (M.). **A study of Endomyces capsulatus Rewbridge, Dodge and Ayers: a causative agent of fatal cerebrospinal meningitis.**—*Ann. Missouri Bot. Gard.*, xx, 3, pp. 471–552, 8 pl., 2 figs., 2 diags., 13 graphs, 1933.

Clinical details are given of cases of human diseases from which were isolated the fungi *Endomyces capsulatus*, *E. capsulatus* var. *isabellinus*, *E. dermatitidis* [*R.A.M.*, xii, p. 441], and a fungus (probably identical with the last named) was also received from a case of blastomycosis or generalized torulosis in Austria (*Arch. für Dermatol.*, clxii, p. 401, 1930). The present study is concerned primarily with *E. capsulatus*, but the observations are also generally applicable to its variety *isabellinus* and to *E. dermatitidis*.

Two life-cycles were found to occur in *E. capsulatus*: one in the parasitized host as a budding yeast cell; and the other in culture representing a perfect Ascomycete, with asci ranging from 7 to 14 μ in diameter according to the medium and containing 8 ascospores 2 to 2·5 μ in diameter. The asci may arise from the copulation of two hyphal cells or by parthenogamy, in which spore production takes place without preceding copulation.

Full details are given of the cultural characters of *E. capsulatus* on numerous media. Slender hyphae and abundant conidia develop on acid media and thick-walled, shorter cells on alkaline substrata. After four years of subculturing the minimum, optimum, and maximum temperatures for the growth of the fungus on beet extract agar were 8°, 25°, and 37° C., respectively, the corresponding hydrogen-ion concentrations being 3·3, 7·4, and 9·3, respectively. The colony diameter in 30 days at P_H 6·1 and 8·2 was 6·8 cm. compared with 8·1 cm. at the optimum, P_H 7·4. In the yeast form *E. capsulatus* may show facultative anaerobiosis, but growth on an artificial medium converts it into a strict aerobe. Gelatine is liquefied in 30 days. The organism was shown, by inoculation experiments on laboratory animals, to have lost its virulence after a four-year period of subculturing.

Wolfram (S.) & Zach (F.). **Über einige durch niedere Pilze verursachte Nagelerkrankungen beim Menschen.** [On some nail diseases of man caused by lower fungi.]—*Arch. für Dermatol.*, clxix, 1, pp. 95–104, 6 figs., 1933.

Latin and German diagnoses are given of *Blastodendrion* [*R.A.M.*, xi, pp. 477, 642] *globosum*, *B. oosporoides*, and *B. gracile* n. spp., isolated from nail affections in Vienna. On maltose agar *B. globosum* is characterized by globular cells, mostly 5 to 5·5, but in some cases up to 12·8 μ, in diameter. The ovoid or more rarely globular cells of *B. oosporoides* measure 7·5 to 9·7 by 4·9 to 6·5 μ. *B. gracile* is characterized by cells of very variable shape and dimensions, being either globular (2·7 to 3·2 μ in diameter), ovoid to oval (mostly 6·5 by 5·4 μ), or elongated (6·5 to 19·5 by 2·5 by 3·2 μ). All the species grew well at 37° C. and liquefied gelatine; *B. oosporoides* was the only one capable of fermenting glucose and levulose.

The clinical conditions induced by the fungi under discussion are fully described.

Podwyssotzkaja (O. N.) & Rosenthal (S. K.). **Über Trichophytose. (Beitrag zur Kenntnis der chronischen Trichophytie der Erwachsenen.)** [On trichophytosis. (A contribution to the knowledge of chronic trichophytosis of adults).]—*Arch. für Dermatol.*, clxviii, 3, pp. 572–585, 4 figs., 1933.

A full account is given of the writers' studies on chronic trichophytosis of adults in Russia (Leningrad and Minsk) from the clinical, mycological, histological, epidemiological, diagnostic, prophylactic, and therapeutic standpoints. The disease was found to be almost exclusively confined to women and to be due in the majority of the 60 cases examined to *Trichophyton violaceum*, while *T. crateriforme* [*R.A.M.*, xii, p. 510], *T. gypseum*, and *Achorion schoenleini* were very occasionally involved.

Davidson (A. M.) & Gregory (P. H.). **Kitten carriers of Microsporon felineum and their detection by the fluorescence test.**—*Canadian Med. Assoc. Journ.*, xxix, 3, pp. 242–251, 3 figs., 1933.

Over half the number of cases of ringworm investigated at Winnipeg were found to be due to *Microsporon audouini* [*R.A.M.*, xii, pp. 23, 693], but the apparent predominance of this organism is partly attributable to its spread among the inmates of an orphanage. Actually two-thirds of the separate outbreaks were traceable to *M. felineum*, and in about half this number evidence was available that infection was contracted from a cat or dog [ibid., viii, p. 576; x, p. 731].

Clinical details and experimental data are furnished in connexion with a case of infection by *M. felineum* in a boy, on whom the first lesions appeared two to three weeks after he had been given an apparently healthy kitten. However, the examination of the latter under the ultra-violet light passing a filter of Wood's glass revealed the presence of fluorescent hairs infected by *M. felineum*. While undergoing treatment, the patient was given a healthy kitten, which in three to four weeks developed typical ringworm, evidently

transmitted by the boy. A third kitten was artificially inoculated in the ear with *M. felineum*. After the resulting lesion had healed, a few fluorescent, infected hairs remained round the eyes for three months, during which period the animal is considered to have been a potential ringworm carrier.

The extension of the fluorescence test to include pet animals is advocated as a practical prophylactic measure against ringworm.

Tomkins (R. G.). **Mycology. The inhibition of the growth of meat-attacking fungi by carbon dioxide.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 48–50, 1933.

When the spores of the meat moulds *Thamnidium chaetocladioides*, *T. elegans*, *Mucor mucedo*, *Cladosporium herbarum*, and *Sporotrichum carnis* were exposed to known amounts of carbon dioxide at constant temperatures [*R.A.M.*, xi, p. 574], the latent period of germination was increased and the rate of elongation of the germ-tube decreased (the tube at the higher concentrations being short and much branched); spore germination was reduced only in concentrations which noticeably prolonged latency and reduced the rate of elongation of the germ-tubes. The growth of the colonies was retarded and the rate of spread (which at given concentrations and temperatures remained constant over long periods) reduced. The concentrations required completely to inhibit growth were, in the first four fungi named, about 30 to 40 per cent. at 15°, 20 to 30 per cent. at 10°, about 20 per cent. at 5°, and 10 to 20 per cent. at 0° C. With *S. carnis* over 30 per cent. of carbon dioxide was required to inhibit growth at 5°.

When spores of the same organisms (except *M. mucedo*) and also of *Mucor* sp., *Penicillium* sp., and *Dematium pullulans* were exposed on agar surfaces to atmospheres containing 99 per cent. carbon dioxide for 17·5, 27, 43, and 66 hours and then removed to air, no obvious differences became apparent in the time required for germination, nor was there any noticeable reduction in percentage germination. Brief exposures to high concentrations of carbon dioxide would not, therefore, appear to be a useful variation of gas storage for the prevention of mould on meat.

Bisby (G. R.), Jamieson (M. C.), & Timonin (M.). **The fungi found in butter.**—*Canadian Journ. of Res.*, ix, 2, pp. 97–107, 1933.

The fungi most frequently isolated from 858 samples of butter examined in Manitoba in 1932 were *Alternaria* sp., *Oospora lactis*, *Mycoderma* spp., and *Phoma hibernica* [*R.A.M.*, xii, p. 24]. The *Alternaria* produces a particularly objectionable dark growth in butter. Other prevalent organisms were *Penicillium chrysogenum* [ibid., xi, p. 325], *P. terrestre* (both common in soil), three species of *Phoma* with spores measuring 4 by 1, 4 to 7 by 3, and 7 to 11 by 2 to 3 μ, respectively, *Paecilomyces varioti* or *Penicillium divaricatum* [ibid., ix, pp. 215, 316], and *Cladosporium herbarum*.

From a table showing the 104 moulds recorded in butter by (*a*) H. Macy (*Minnesota Agric. Exper. Stat. Tech. Bull.* 64, 1929), (*b*) M. Grimes *et al.* [*R.A.M.*, x, p. 242], and (*c*) the present writers, it appears that only three are mentioned in all the papers cited, namely, *A.* spp., *C. herbarum*, and *O. lactis*. The last named is

ubiquitous in milk, while the two others are common on plant refuse. It is thought probable that nearly all the moulds affecting butter originate in the soil, on plant débris, or in manure. About half of the 65 fungi identified in Manitoba butter were also isolated from the local soils [ibid., xii, p. 534]. The moulds may be destroyed by pasteurization, but subsequent to this process extreme vigilance is necessary for their exclusion from the cream or butter. Parallel inoculation experiments on salted and unsalted butter showed the high protective value of salt, which should be added to all consignments intended for lengthy storage or overseas transport. Other factors promoting freedom from contamination are low temperature and low humidity.

Shchepetilnikova (A. M.). **Chloropicrin as a means of combating weeds and Flax sickness in soils.**—*Chemisation Socialistic Agr., 1933*, 2, pp. 128–135, 1933. [Abs. in *Chem. Abstracts*, xxvii, 22, p. 5879, 1933.]

Chloropicrin [*R.A.M.*, iii, p. 552] was found to be a very effective remedy for 'flax sickness' in Russian soils, decreasing the number of the fungi involved [e.g., *Fusarium lini*, *F. russianum*, *Colletotrichum lini*, and *Alternaria* sp.: ibid., xii, p. 220] and augmenting the bacterial flora. The disinfectant was applied at the rate of 0·013 to 0·28 gm. per kg. of soil in pots and up to 20 gm. per sq. m. in the field. The effects of the treatment persisted into the second year.

Muskett (A. E.) & Taylor (J. C.). **Diseases of the Rose. The control of Rose rust by summer spraying.**—*Journ. Min. Agric. Northern Ireland*, iv, pp. 62–66, 1933.

A tabulated account is given of the writers' experiments in Northern Ireland in 1932 on the control of rose rust (*Phragmidium mucronatum*) [*R.A.M.*, xii, p. 194] by four applications (18th and 25th August, 8th and 17th September) of the following fungicides: (1) bouisol [see below, p. 121] and soft soap, 0·5 oz. of each per gall.; (2) Bordeaux mixture (1·5 oz. copper sulphate and 1 oz. unslaked lime per gall.); (3) liver of sulphur and soft soap (0·33 or 0·66 oz. and 0·5 oz., respectively, per gall.); and (4) sulsol [ibid., xi, p. 587] and soft soap (1 and 0·5 oz., respectively, per gall.). The varieties used were the susceptible Lady Pirrie, Mrs. Henry Morse, and Margaret McGredy budded on *Rosa canina* stock. Of the four treatments the last gave the best results (77·2 per cent. rust-free leaves compared with 31·4 and 24·6 per cent., respectively, in two control plots). Bordeaux mixture and bouisol also gave quite satisfactory control (75·4 and 73·9 per cent. healthy leaves, respectively), but both caused unsightly markings or discoloration, while liver of sulphur failed to check the disease adequately.

Bordas (J.), Joëssel (P. H.), & Anrès (É.). **Enquête sur les dépérissements de la Lavande.** [Inquiry into the wilts of Lavender.]—*Ann. des Épiphyties*, xviii, 6, pp. 368–383, 1932. [Received November, 1933.]

During the past ten years a wilt of lavender [cf. *R.A.M.*, xi, p. 375] which has become prevalent in the south-east of France has

caused the abandonment of certain plantations. Dead or wilting plants are scattered among healthy ones over large areas, and in certain localities the mortality due to the condition is increasing. The disease progresses slowly, the oldest branches succumbing first, but frequently being replaced by shoots which develop abundantly near the collar. The stems or main pivotal roots show discoloured areas corresponding with the affected branches. Finally, a wet rot, probably due to secondary saprophytes, sets in.

No symptoms characteristic of attack by any soil-inhabiting fungus were observed and no one fungus was constantly present, only probably saprophytic or weakly parasitic organisms being noted. In one instance *Armillaria mellea* was found on a hybrid between *Lavandula vera* and *L. latifolia* growing where a vine had previously died from root rot [ibid., ix, p. 360].

The condition is probably associated with unsatisfactory soil or cultural factors in recently established plantations.

Fajardo (T. G.). **Sclerotium stem rot of Delphinium and other ornamental plants in Trinidad Valley, Mountain Province, Philippine Islands.**—*Philipp. Journ. of Sci.*, li, 4, pp. 447–453, 1933.

In May, 1932, annual delphiniums in Trinidad Valley, Mountain Province, Philippine Islands, were found to be severely attacked (5 to 10 per cent. infection) by *Sclerotium rolfsii*, apparently not hitherto recorded on this host in the country, but widely distributed there on a number of other garden and ornamental plants and also the cause of a stem and root rot of beans (*Phaseolus vulgaris*) and tomatoes. Inoculation experiments with the fungus gave positive results on delphinium, bean, and tomato. A comparative study of the Philippine delphinium organism with three strains of *S. delphinii* and with cultures of *S. rolfsii* from the United States [*R.A.M.*, xi, p. 785] established its identity with the latter and revealed differences from *S. delphinii* in the size, number, and markings of the sclerotia.

Brierley (P.). **Dahlia mosaic and its relation to stunt.**—*Bull. Amer. Dahlia Soc.*, Ser. ix, 65, pp. 6–11, 19, 4 figs., 1933.

Cross-inoculation tests have shown that the conditions variously known in the United States as 'dwarf', 'rugose rosette', 'rugose mosaic', and 'veinal mosaic' are merely the divergent reactions of different dahlia varieties to mosaic, which is not, however, synonymous with 'stunt' [*R.A.M.*, xii, p. 697]. Definite evidence of mosaic is stated to have been detected in some 461 dahlia varieties. Notes are given on the transmissibility and control of the disease.

Stapp (C.). **Die Weissfäule der Hyazinthen.** [The white rot of Hyacinths.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 23–24, pp. 459–474, 3 figs., 1933.

Hyacinth bulbs sent from the Dutch Flower Bulb Investigation Institute for testing at the Biological Institute, Berlin-Dahlem, contracted white rot, originally described by A. Heinz (*Zentralbl. für Bakt.*, Ab. 2, v, p. 535, 1889) as due to *Bacillus hyacinthi septicus*, during the winter of 1930–1. The affected varieties were L'Innocence,

Gertrude, and Queen of the Blues, whereas Queen of the Pinks remained healthy. Subsequently the white rot was also observed on two plants from central Germany.

The most striking symptom of the disease is the rapid conversion of the infected tissues into a pulpy or viscous, malodorous mass. In most of the cases observed, the rot originated at soil level on the inflorescence axes of fully grown plants, the tissue of which darkened and became water-soaked; shortly afterwards the whole upper portion bearing the inflorescence fell over, infection spreading to the leaves and finally to the bulb scales. Occasionally the bulbs were attacked before or during the elongation of the shoot.

The causal organism is a rod measuring 1·6 to 2·8 by 0·6 to 0·7 μ, with peritrichous flagella, Gram-negative, forming transparent, white, glistening, smooth-edged colonies, liquefying gelatine, coagulating milk and litmus milk, making little growth in Uschinsky's and Fermi's solutions and practically none in Cohn's, reducing nitrates, producing no indol and leaving starch almost intact, utilizing arabinose, xylose, glucose, fructose, saccharose, lactose, raffinose, and mannite with acid and gas formation, and growing best with peptone or asparagin as sources of nitrogen. The minimum temperature range for its development was −1° to 2.8°, the optimum 23° to 25·6°, and the maximum 36° to 38°. Details are given of the cultural characters of the organism on a number of standard media.

Positive results were given by inoculation experiments on all the above-mentioned hyacinth varieties, showing that Queen of the Pinks, though relatively resistant, is not immune, while L'Innocence was the most susceptible. The symptoms developed more rapidly at 27° than at 22°. Other plants reacting positively to inoculation with the hyacinth pathogen were potatoes (shoots and tubers), tomatoes, tobacco, beans [*Phaseolus vulgaris*], peas, lupins (*Lupinus mutabilis*), red and white cabbage, fodder beets, radishes, horse-radish, carrots, cucumbers, onions, gladiolus, and *Pelargonium zonale* (one strain of the bacterium only).

In its morphological, cultural, and physiological characters the hyacinth white rot organism corresponds in the main with *B. phytophthorus*, and agglutination experiments indicated its extremely close relationship with the fifth sub-group of this species, *B. carotovorus iris* Leach [*R.A.M.*, viii, p. 397]; it is placed in a new (sixth) sub-group of *B. phytophthorus*. The positive reaction of *P. zonale* to only one strain of the hyacinth organism agrees with the results obtained by P. Brierley in his inoculation tests with *B. phytophthorus* [ibid., viii, p. 195], so that the differential behaviour towards this plant of the various strains within the species may well serve as a diagnostic character.

Control measures should include storage in a dry, well-ventilated room, the bulbs being not in contact with one another; timely planting so that the bulbs are well rooted by forcing time; and the avoidance of excessively early forcing at high temperatures.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Fusarium wilt and corm rot of Freesias.**—*Bot. Gaz.*, xcv, 1, pp. 128–142, 25 figs., 1933.

Fusarium bulbigenum, *F. martii-minus*, *F. moniliforme* [*Gibbe-*

rella moniliformis], and *F. solani* were isolated from freesia corms infected by a destructive rot prevalent in California, Florida, and Indiana, and reproduced the disease in inoculation experiments. *F. conglutinans* from cabbage and *F. lycopersici* from tomato also produced the typical symptoms on inoculation into freesias, while five other species, viz., *F. batatatis* from sweet potato, *F. niveum* from watermelons, *F.* sp. from Panama wilt of bananas, *F. vasinfectum* from cotton, and *F.* sp. from decayed gladiolus corms, caused less severe injury to the corm plate and rootlets. Infection is conveyed by diseased corms and remnants of wilted plants, and through the soil.

F. solani and *F. martii-minus* caused a decay of inoculated onion bulbs, while *Gladiolus* corms planted in soil inoculated with these two species, *G. moniliformis*, and *F. bulbigenum* contracted a decay of the plates which prevented the development of new roots.

Brown (J. G.) & Evans (M. M.). **The natural occurrence of crown gall on the Giant Cactus, Carnegiea gigantea.**—*Science*, N.S., lxxviii, 2017, pp. 167–168, 1933.

Both aerial and root galls have been observed by the writers on the giant cactus (*Carnegiea gigantea*) in the mountain forests of Arizona, the former reaching a diameter of 2 ft. or more while one root gall, consisting of spongy parenchymatous tissue covered with greyish bark, weighed 8½ lb., measured 10 in. across, and had a short stalk 1½ in. thick. Small galls form lumps on the surface of the cactus, which may leave holes in the columnar trunk when the galls are 'abscissed' by a cork layer, while in other cases the growth of the tumours may be so rapid that the host fails to 'wall off' the enlarging cell mass. The organism isolated from the cactus galls was found to correspond with the peach and cottonwood [*Populus deltoides*] strains of *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xii, p. 358]; inoculation experiments to confirm the identity of the pathogen are in progress.

Discussing the origin of crown gall on the cactus and other wild plants in Arizona, the writers are inclined to think, from the extent and location of the infections, that the pathogen is indigenous to the region.

Johnson (E. M.). **A ringspot-like virus disease of Red Clover.**—*Phytopath.*, xxiii, 9, pp. 746–747, 1 fig., 1933.

Kentucky, Oregon, Wisconsin, and French red clover (*Trifolium pratense*) strains at the Kentucky Agricultural Experiment Station showed, in September, 1931, small, irregular to circular, yellowish spots, a few mm. to 2 cm. in diameter, with well-defined necrotic borders, on the leaves, some of which were completely discoloured while the stems of certain plants also bore long, narrow, irregularly oval, yellow areas. The spots resembled those of yellow ring spot of tobacco [*R.A.M.*, xii, p. 473], a row of plants affected by which was growing a few feet from the clover. Negative results, however, were given by experiments in the transmission of the clover disease to 27 Turkish tobacco plants by rubbing the infective juice on their leaves, as well as by aphids, while garden beans (*Phaseolus vulgaris*) also failed to contract the symptoms on inoculation by

the former method. None of the 165 clover seedlings produced by 255 seeds from five plants showed any trace of the ring spot.

Mayor (E.). **Relations entre les écidies de Euphorbia verrucosa Lam. et un Uromyces sur Vicia cracca L.** [The relations between the aecidia of *Euphorbia verrucosa* Lam. and a *Uromyces* on *Vicia cracca* L.]—*Bull. Soc. Sci. Nat. Neuchâtel.*, lvi, pp. 341–352, 1 fig., 1932.

Full details are given of the successful inoculation experiments conducted by the writer in the Jura mountains, Switzerland, with the teleutospores of a *Uromyces* from *Vicia cracca* on *Euphorbia verrucosa*, which commonly bears aecidia in nature. Conversely, the aecidia from *E. verrucosa* infected *V. cracca*. The fungus was found to differ from *U. fischeri-eduardi* and *U. genistae-tinctoriae*, the aecidia of which are formed exclusively on *E. cyparissias*, though resembling the former in various particulars, and is accordingly named *U. verrucosae-craccae* n. sp., with a Latin diagnosis. The pycnidia and aecidia of the organism have been described in the literature under the name of *U. excavatus* (DC.) Lév. The uredospores are globose or subglobose, yellowish-brown, 18 to 23 μ in diameter, furnished with 5 or 6 germ pores and sometimes with a minute, hyaline papilla; the teleutospores are brown, globose or subglobose, rarely ellipsoid, usually 19 to 23 by 18 to 20 μ, occasionally 18 to 28 by 16 to 21 μ, rounded at both ends, having an apical germ pore, frequently a minute (up to 3 μ), light brown papilla, and with a hyaline pedicel, up to 20, rarely 30, by 4 to 5 μ. This rust attacks the foliage, petioles, and stems of *V. cracca*, not only in Switzerland but also in Austria, Germany, France, Spain, and Italy.

McCown (M.). **Weak Bordeaux spray in the control of fire blight of Apple.**—*Phytopath.*, xxiii, 9, pp. 729–733, 1933.

Bordeaux mixture 1–3–50, applied early in the flowering period (beginning of May) to Grimes apple trees at Lafayette, Indiana, reduced the incidence of fireblight (*Bacillus amylovorus*) in the blossom clusters inoculated both immediately and 24 hours after spraying by about 50 per cent. in 1931. In 1932 only 10 per cent. of the sprayed clusters developed fireblight compared with 57 per cent. of the untreated controls. In 1930 natural infection in Jonathan clusters was reduced 67 per cent. by one application of 1–3–50 Bordeaux in the early stage of full bloom. The mixture caused no apparent injury to the foliage or fruit and the set of the latter was not reduced.

Bouman (Adriana M.). **Bestrijding van bacterielle wortelknobbels bij Appel en Peer.** [The control of bacterial root galls in Apple and Pear.]—*Tijdschr. over Plantenziekten*, xxxix, 9, pp. 217–224, 1933. [English summary.]

Satisfactory control of crown gall (*Bacterium tumefaciens*) on the roots of apple and pear seedlings was given in a Dutch nursery by the immersion of the young plants after cutting back in a thick paste consisting of 0·5 per cent. uspulun and about the same quantity of clay soil [*R.A.M.*, v, p. 694]. This treatment can be

applied at the low cost of Fl. 3·75 per hect. and is therefore to be generally recommended. Soil disinfection with uspulun (0·5 per cent., 10 l. per sq. m.) is a less reliable and much more expensive method. In a preliminary test to determine the relative susceptibility to crown gall of certain quince and Paradise apple stocks from East Malling, Kent, in heavily infested soil, the former appeared to be entirely immune while the latter varied in their reaction, type I appearing, from the very limited tests made, to be the most resistant [cf. ibid., xii, pp. 298, 639].

Swarbrick (T.). **The spraying of farm orchards as a means of increasing the cider fruit crop.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 47–65, [1933].

In discussing the major problems relating to the spraying of cider apple orchards, particularly the economic aspect of disease control, the author gives brief practical directions for the control of various insect pests and of scab [*Venturia inaequalis*], based on the experience gained in commercial orchards. In the west of England spraying for disease control has not yet been widely adopted on farm orchards, which are regarded as merely subsidiary to general farming practice ; furthermore, the trees are often very large and it is not essential that the fruit should be entirely unblemished.

Some details are given of the cost of spraying cider apple trees based on experience gained in the cider apple orchard at Long Ashton. It is concluded that the combined cost of winter washing for insect control and a single application of lime-sulphur against scab and red spider [*Oligonychus ulmi*] at the pink bud stage should not exceed 3*s.* 6*d.* per tree and in many cases may not be more than 2*s.* 6*d.* per tree. In a light crop year the scab spraying may be omitted or it may be found profitable to alternate winter washing with summer spraying in successive years.

Kearns (H. G. H.), Marsh (R. W.), & Pearce (T. J. P.). **Experiments with combined insecticide-fungicide sprays for Apples.** —*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 66–85, [1933].

An account is given of some experiments with combined insecticidal-fungicidal sprays at Long Ashton, in which it was found that only slight scorching followed the use between the green flower and pink bud stages of 2 per cent. Shell P2 white oil emulsified with agral S.R., to which was added sufficient lime-sulphur to make a 3 per cent. lime-sulphur spray, and that scorching was not serious when the spray consisted of 5 per cent. oil and 3 per cent. lime-sulphur at the green flower stage, 2 per cent. oil and 3 per cent. lime-sulphur at late pink, and 2 per cent. oil with 1·5 per cent. lime-sulphur at petal fall. The varieties sprayed were Bramley's Seedling, Lane's Prince Albert, and Worcester Pearmain in the first series and the last-named only in the second.

In a preliminary trial with sprays designed to combine the post-blossom applications against scab [*Venturia inaequalis*] with nicotine, two sprays containing wetting agents more effective than soap and compatible with lime-sulphur were made up, consisting

of 1·5 galls. lime-sulphur, 8 oz. nicotine, and either 2·5 lb. agral I or 1 lb. 'lethalate wetting' per 100 galls. water. Nine Worcester Pearmain trees were sprayed on 7th June with 20 galls. of the first, and nine others with the same quantity of the second. No spray damage resulted, and the scab control obtained was not inferior to that observed on comparable trees sprayed with lime-sulphur only.

Marsh (R. W.). **Trials with a 'colloidal' copper spray fluid.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 86–89, [1933].

When Stirling Castle apple trees at Long Ashton were sprayed against scab [*Venturia inaequalis*: *R.A.M.*, xi, p. 112] midway between the green flower and pink bud stages and again on 18th June with bouisol (3 and 1·5 pints per 100 galls., respectively) [ibid., xii, p. 199 and below, p. 121], sufficient russeting developed to lower the commercial value of the fruit. Three Lane's Prince Albert trees given the same treatments remained entirely free from russeting, and gave 71 per cent. clean and slightly scabbed fruits as against 30 per cent. on the unsprayed controls. The absolute standard of control obtained was not, however, high, suggesting that while bouisol may safely be used as a post-blossom spray on this variety, better protection is necessary in the pre-blossom stage.

Requests having been received for a spray treatment against black currant leaf spot [*Pseudopeziza ribis*: ibid., viii, p. 656] which could be applied before picking without leaving an excessive deposit, French (relatively resistant) and Baldwin (susceptible) bushes planted in 1930–1 were sprayed on 14th June with bouisol, 1·5 pints per 100 galls. The crop, picked on 25th July, showed no perceptible spray residue. On 30th July, other bushes of the same varieties were given a post-cropping application of Bordeaux mixture 2–4–50 or bouisol 1·5 pints per 100 galls., and the results showed that bouisol was approximately as effective after cropping as Bordeaux mixture. The pre-cropping application of bouisol had little effect by the end of September, but as this spray leaves no visible residue it may prove to be of value as an adjunct to the standard post-cropping application of Bordeaux mixture.

Goodwin (W.), Martin (H.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab: Allington Pippin and Newton Wonder, 1932.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxii, p. 95–107, 1933.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xii, p. 101] conducted in Kent in 1932, Allington Pippin and Newton Wonder trees received two pre- and two post-blossom applications either of home-made Bordeaux mixture (8 : 12 : 100) or of an emulsion of 1 gall. of a crude expressed oil of mustard of high acid value (equivalent to 27·3 gm. oleic acid per 100 ml.) and 4 galls. of 10 per cent. copper sulphate in 95 galls. of water with 6 lb. hydrated lime. The oil emulsified readily, but a scum of copper and calcium soaps prevented the use of a strainer in the tank. This emulsion was tested because there was reason

to believe that it could be applied as a heavy wash [ibid., xii, p. 774], thus saving time; that, probably requiring less copper than Bordeaux mixture, it would obviate spray injury; and because similar vegetable oils have been found effective against hop powdery mildew [*Sphaerotheca humuli*: cf. ibid., xi, p. 253].

The results obtained [which are tabulated and fully discussed] showed that in the unsprayed Allington Pippin control plots the scab-free apples averaged 21 per cent. of the crop, the corresponding figures for the plots sprayed with Bordeaux mixture and the emulsion being, respectively, 94 and 89 per cent. In the Newton Wonder control plots the scab-free apples averaged 3 per cent. of the crop, the corresponding figures for the plots treated with Bordeaux mixture and the emulsion being 89 and 53 per cent.

The Allington Pippin trees sprayed with Bordeaux mixture showed 2·9 per cent. of the total crop and 3·1 per cent. of the grade 1 apples russeted, the corresponding figures for the trees sprayed with the emulsion being 1·6 and 1·9; with the Newton Wonder trees the figures were, respectively, 2·8, 3, 0·6, and 0·8 per cent., the russeting due to the emulsion being negligible.

That the emulsion gave a less satisfactory degree of control than the Bordeaux mixture on the Newton Wonder trees is attributed to its inferior fungicidal efficiency. Periodic determination of the amount of copper remaining on the foliage, allowance being made for leaf growth, demonstrated that on every occasion after blossoming more copper was present on the leaves sprayed with Bordeaux mixture than on those sprayed with the emulsion. The retention of the deposit did not appear to have been improved by the presence of the oil to the same extent as in other trials with a cheap cotton-seed oil of low acid value which formed only a negligible amount of copper-calcium soap. A better protective fungicidal action would probably have resulted if in the preparation of the emulsion the formation of copper soaps could have been avoided.

KENT (W. G.). **A commercial Apple-spraying demonstration in 1932.**—*Journ. Min. Agric.*, xl, 5, pp. 420–430, 1933.

The increase in the percentage of Bramley's Seedling apples free from scab [*Venturia inaequalis*] in a 6½ acre orchard near Maidstone, Kent, when sprayed four times with Bordeaux mixture (3¼–5–40 plus 26 oz. lead arsenate) on 19th April, 13th and 27th May, and 16th June, 1932, ranged from 51 to 65 in the different plots (87·9 to 94·9 per cent. clean apples compared with 28·9 to 37 in the controls), the corresponding figures for the lime-sulphur treatment (1⅓ in 40 galls., subsequently diluted to 1 in 79 plus lead arsenate and supplemented by a spreader) being 42 to 53. The total cost of the former treatment was £7 19*s.* 4*d.* and of the latter £10 7*s.* 8*d.*, exclusive of the allowance for the machinery, estimated at about 30*s.* per acre for the whole season. For the first and second applications four 10 ft. metal lances, with 'Mistifier Junior' nozzles fitted with No. 2 disks were used; in the third the Bordeaux mixture was applied through No. 0 disks and the lime-sulphur through an intermediate size between 2 and 3, while a new type of double nozzle, the 'Noblox', with No. 2 disks, was used with the Bordeaux mixture in the fourth spray. 'Merryweather'

portable pipes connected the rubber delivery hoses to the pump in the first three applications, but in the last the sprayer was drawn by a tractor. The Bordeaux-treated trees showed a dark purplish tinting of the foliage from August onwards, but the quality of the crop was not impaired.

Babel (A.). **Schorfbekämpfung nach neuen Beobachtungen.** [Scab control on the basis of new observations.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz,* xliii, 8–9, pp. 498–500, 3 figs., 1933.

The comparative examination of the foliage of 12-year-old apple trees sprayed against scab [*Venturia inaequalis*] about 12th May, 1933, at Opladen [Rhine] with (*a*) sulphur fungicides (lime-sulphur and solbar, 1 or 2·5 per cent.) and (*b*) copper mixtures (0·5 per cent. nosprasit 0 [*R.A.M.*, xii, p. 233] and a new compound at 2 per cent.) indicated the marked superiority of the latter preparations [cf. ibid., xii, p. 450]. The scab lesions were found to have been burnt away by the copper mixtures, whereas the sulphur preparations failed to prevent their extension. The burning action of the copper was particularly noticeable on the relatively resistant, late Zuccalmaglio, the scab spots on which were instantly killed by the treatment, whereas on other varieties, e.g., Lord Suffield and Canada Pippin, the effects were more gradual. The above-mentioned treatments were applied five days after the first trace of infection was detected on the early varieties, no sign being yet apparent on Zuccalmaglio, and it is suggested that this time should be regularly adopted as the starting-point of the spraying schedule. The incidence of storage scab [ibid., xii, p. 377] in a test by the writer on the Jacob Lebel variety in 1932 amounted to 34·9 per cent. after six weeks in the sulphur-treated fruit, compared with only 9·7 per cent. among the apples sprayed with copper compounds.

Horne (A. S.). **Biological work on fruit.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932,* pp. 279–300, 3 pl., 2 diags., 5 graphs, 1933.

In investigations conducted in collaboration with Miss F. M. Carter on the pathogenic fungi present in the air of apple orchards [*R.A.M.*, xii, p. 32] more than 20,000 fungal and bacterial colonies were obtained on the exposed plates between 2nd May, 1930, and 17th September, 1931. The fungi identified at four localities are listed, and the estimated frequencies of 18 genera at two of them arranged in descending order.

In work with E. M. Eweis a special technique was devised to ascertain whether different apple-rotting fungi enter through the skin or through a lesion, and, in the former case, whether they are able to penetrate only through the lenticels. Bramley's Seedling and Oregon apple segments were supported in watch glasses, the lenticel inoculations being carried out by means of vaccine tubes sealed at the ground end to the selected lenticel. The fungi used included *Botrytis cinerea, Phomopsis coneglanensis, Sphaeropsis* sp., *Fusarium* [*lateritium* var.] *fructigenum, Alternaria* sp., *Polyopeus purpureus, Monilia* [*Sclerotinia*] *fructigena,* and a *Penicillium.* The results clearly demonstrated that all the fungi tested were able

to pass through lenticels. There was considerable variation in the time required by a given fungus to penetrate lenticels and cause decay.

Further studies (with Miss Carter) of resistance in relation to the chemical composition of apples with special reference to the interaction between fungal growth and varied acid, sugar, and nitrogen content [ibid., xii, p. 32] were made with fungi isolated from spots on Worcester Pearmain apples, including strains of *P. purpureus*, *Pleospora herbarum*, *F.* [*lateritium* var.] *fructigenum*, and *Alternaria* sp. It was found that changes in the concentration of sugar within the experimental limits had little effect on radial spread of the fungi, and little effect was observed when sucrose was substituted for glucose. Preliminary tests showed that the fungi varied in their response to changes in the nitrogen supply. When acid was present the same fungi varied more widely in their response, *Alternaria* falling in growth rate from zero to 0·04 per cent. nitrogen and then becoming nearly constant and *P. purpureus* rising sharply to 0·02 per cent. nitrogen and continuing to rise more slowly with increasing nitrogen. Data obtained with H. K. Archbold showed that in individual Bramley's Seedling apples the acid and nitrogen content ranged, respectively, from 0·670 to 1·374 and from 0·0142 to 0·0495 per cent.

Studies with S. N. Das Gupta of the significance of changes associated with age in the resistance of apples, in which Bramley's Seedling apples gathered early and late were inoculated with six saltant strains of *Cytosporina ludibunda* [ibid., xii, p. 782] and others gathered at the same time were inoculated periodically with three strains of the same fungus, showed that the nature of fungal response to increasing age of fruit varied with the fungal strain. When the data of radial advance recorded for 24 strains of species of *Cytosporina*, *Phomopsis*, and *Diaporthe* during 1927–9 were subjected to statistical analysis the results obtained [which are tabulated] showed that the strains fell into four classes as regards their power of attacking Bramley's Seedling apples. Thus, in the first class, radial advance in mm. per day for *P. coneglanensis*, three strains of *D. perniciosa*, and *P. mali* was, respectively, 0·1694, 0·1600, 0·1355, 0·0855, and 0·0976, while the corresponding figures for the lowest class were *C. ludibunda* strain CA_4 0·0180, *P. vexans* 0·0099, *P. pseudotsugae* 0·0034, and *C. ludibunda* strain CC_2 0·0023 mm.

A comparison of the data obtained during 1930 and 1931 showed quite clearly that East Malling stocks IV and VI in both years produced Bramley's Seedling apples more resistant to storage rots than stocks V and X [ibid., xii, p. 33].

Further tests were made of the effect of manuring on the resistance of apples [loc. cit.], all the samples being inoculated with *C. ludibunda* CE and stored at laboratory temperature. The results obtained indicated, as in the previous year, the existence of a relationship between resistance of the fruit and treatment of the trees with sulphate of ammonia, the value of mean radial advance, for instance, obtained for plots which received sulphate of ammonia in 1930, 1931, or in both years being 0·692 as against 0·364 calculated for plots not receiving nitrogen in any form.

Brian (P. W.). **Experimental study of moulds responsible for the wastage of Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 66–68, 1 graph, 1933.

When spores of *Fusarium lateritium*, *Gloeosporium* sp., and *Trichothecium roseum* in water were exposed to the volatile products given off by apples, germination was considerably stimulated, the latent period being shortened, rate accelerated, and a stouter germ-tube produced. On the other hand, with *Penicillium expansum* the latent period was increased and germination rate retarded. Unlike those of the other moulds studied, the spores of *P. expansum* scarcely germinated at all in water, and did not appear to be wetted. Lack of nitrate or phosphate reduced germination by at least 70 per cent. in all the moulds studied, though all the spores were completely wetted; lack of sugar also reduced germination, but was associated with incomplete wetting.

Kidd (F.) & West (C.). **The control of superficial scald of Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 58–62, 1 graph, 1933.

After stating that in the gas storage of English apples the conditions set up in the storage chamber are favourable to scald [*R.A.M.*, xii, p. 423] and intensify the inherent tendency to it shown by certain varieties, the authors describe a series of experiments conducted to compare the degrees of control given by wrappers containing different proportions of oil and made of two types of paper, one being an absorbent tissue with an air-dry weight of 1·42 gm. per 10 in. square sheet and the other a less absorbent tissue weighing 1·25 gm. per sheet. The apples, which were of the highly susceptible Newton Wonder variety, were gas-stored (some weeks after being gathered) at 3° C. in an average concentration of 3 to 4 per cent. carbon dioxide.

The results obtained [which are tabulated, graphed, and discussed] indicated that wrappers containing 20 per cent. oil would probably have given almost complete protection; the lighter paper, though containing slightly less oil, gave better control than the heavier.

Carne (W. M.). **Low temperature breakdown in Tasmanian Apples.**—*Journ. Australian Council Sci. & Indus. Res.*, vi, 3, pp. 217–218, 1933.

Attention is drawn to the occurrence in Southern Tasmanian cool stores of a serious low temperature breakdown of apples (chiefly of the Scarlet, Sturmer, and French Crab varieties), previously reported from Great Britain [*R.A.M.*, viii, p. 252], the United States, and New Zealand [ibid., xii, p. 573], but not from Australia [ibid., x, p. 115]. Recent storage tests have shown that the incidence of breakdown in Cox's Orange Pippins ranges from double to 30 times as much after ten weeks' storage at 31° to 34° F. as at 38° to 40°. The disorder in this variety, Sturmer, and French Crab is of the 'soggy' type, whereas in Jonathan and Scarlet it is 'mealy' [ibid., vii, p. 790]. In 1932 the Scarlet variety also suffered from 'core flush' [ibid., xiii, p. 36].

Arnaud (G.). **Essais de traitements des arbres fruitiers et de la Vigne.** [Experimental spray treatments of fruit trees and Vines.]—*Ann. des Épiphyties*, xviii, 6, pp. 357–367, 1 pl., 1932. [Received November, 1933.]

In tests conducted at Versailles in 1932, excellent control of pear scab (*Venturia pirina*), even on the highly susceptible Doyenné d'hiver variety, resulted from three applications, one pre-blossom and two post-blossom, of 2 per cent. Bordeaux mixture, similar control of apple scab (*V. inaequalis*) and vine mildew (*Plasmopara viticola*) being given by three applications at 1 per cent. and five at 2 per cent., respectively.

A colloidal copper product, 'bouillie B.C.C.', containing (undiluted) 12·5 per cent. copper, was about one-half to two-thirds as effective as the Bordeaux mixture.

Fish (S.) & Greatorex (F. J.). **The control of summer spot of Pears.**—*Journ. Dept. Agric. Victoria*, xxxi, 9, pp. 438–442, 4 figs., 3 graphs, 1933.

The authors state that black or summer spot [scab: *Venturia pirina*: *R.A.M.*, xiii, p. 36] is one of the more serious factors that limit the export of pears from Victoria, where in 1932 it rendered some 25 per cent. of the fruit unfit for the trade. After a brief, popular outline of the life-history of the parasite, a few details are given of spraying experiments in 1932 at Doncaster, Victoria, on the pear varieties Packham's Triumph, William's Bon Chrétien, Beurré Bosc, and Winter Nelis which, together with Vicar of Winkfield, are the most susceptible to this disease. The results showed that the maximum of fruit suitable for export (nearly 90, 60, and over 80 per cent. in Packham's Triumph, Bon Chrétien, and Beurré Bosc, respectively) was obtained from trees that received two pre-blossom sprays (just as the young folded leaves were protruding, and when they were well separated from the unopened blossom bud) with 6-4-40 Bordeaux mixture, followed by an application of half-strength Bordeaux mixture when the fruit was set. Where, however, the fruit cover spray consisted of 1 in 80 lime-sulphur instead of Bordeaux mixture, the percentage of marketable fruit was reduced in the same varieties to 40, 20, and 45, respectively, chiefly owing to the development of this disease. The two pre-blossom sprays caused no visible injury on the four varieties tested, and only very slight russeting resulted from the half-strength Bordeaux mixture cover spray on the fruit.

Rose (D. H.) & Lutz (J. M.). **Injury to Pears caused by paper liners impregnated with sodium silicate.**—*Journ. Agric. Res.*, xlvii, 3, pp. 153–162, 3 figs., 1933.

A brown spotting which has been observed in recent years on russeted varieties of pears packed in wooden boxes, either immediately on their arrival at various United States markets or in cold storage lots, was experimentally shown to be caused by the alkaline sodium silicate adhesive used to join the paper lining inside the boxes. It was found that when the sodium silicate was neutralized with sulphuric acid, no discoloration of the pears ensued, and that the spotting was almost entirely removed from Winter

Nelis pears by standing the fruit for one hour in a 1 per cent. solution of hydrochloric acid. The direct cause of the injury appeared to be the alkaline substances contained in commercial sodium silicate. Paper linings joined with other adhesives did not discolour the pears.

Fisii (S.). **Brown rot in Peaches. Goulburn valley fruit in Sydney.**—*Journ. Dept. Agric. Victoria*, xxxi, 8, pp. 381–383 and 387, 3 figs., 1933.

The author states that the chief obstacle to the development of a steady and profitable market in Sydney for the peaches grown in the Goulburn valley is the deterioration of the fruit during transit, due to mechanical injury to the fruit in packing with consequent development of brown rot [*Sclerotinia fructicola*: *R.A.M.*, xiii, p. 33]. In the last season the Goulburn fruit marketed in Sydney was sold at a loss to the growers of about £20,000, largely due to wastage from brown rot, which was exceptionally prevalent in the orchards. The conditions that favour infection of the fruit in the orchard are discussed and the measures which may minimize the incidence of the rot indicated, among which strict sanitation of the orchards, involving the removal from them of all infected material, avoidance of too mature fruit, rapid precooling, and the spraying of the trees with lime-sulphur or ammonium polysulphide, in addition to the usual spraying schedule with Bordeaux mixture, are considered to be the most likely to give good results. The ammonium polysulphide spray may be applied very near picking time without leaving a noticeable spray deposit on the fruits.

Vaughan (E. K.). **Transmission of the crinkle disease of Strawberry.**—*Phytopath.*, xxiii, 9, pp. 738–740, 1 fig., 1933.

During the winter of 1931–2 greenhouse tests were carried out at the Oregon Agricultural Experiment Station to determine the nature of the infective principle in strawberry crinkle [*R.A.M.*, xi, p. 792] and its mode of transmission.

Strawberry leaf aphids (*Myzus fragaefolii*) were transferred from diseased Marshall plants to a total of 50 healthy plants of the same variety, on which they were allowed to feed for a week. Of these 42 (84 per cent.) contracted the symptoms of crinkle which later disappeared, however, in 23. Non-viruliferous, adult female aphids were transferred, after several weeks' colonization and multiplication, from one lot of healthy Marshall plants to another with negative results. Five out of ten Marshall plants to which aphids were transferred after feeding for 14 days on the mildly affected Ettersburg No. 121 variety developed 'pin-point' chlorotic areas without any other symptoms. Attempts at the transmission of crinkle by grafting, leaf mutilation, or the use of diseased leaf extracts gave negative results.

Ogilvie (L.). **The control of hard rot of Strawberry fruits.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, p. 102, [1933].

Paxton strawberries severely infected with hard rot (*Septoria*

fragariae) [*R.A.M.*, xi, p. 726] were sprayed with Bordeaux mixture 5–7·5–50 in August, 1931 and the following May, another similar plot being treated with 5 per cent. tar oil emulsion on 22nd January, 1932. On 17th June, 1932, these plots showed, respectively, 1 and 7 per cent. fruit infection, as against 52 per cent. in the untreated control plot, the corresponding figures on 7th July being 25, 20, and 64 per cent. The tar oil treatment killed off the leaves in January, but these were succeeded by others which remained vigorous and healthy, and a good crop resulted.

Vogel (F.). **Über die Bedeutung der Nährstoffe und des Kali-Stickstoffverhältnisses bei der Stachelbeere (Vorläufige Mitteilung).** [On the importance of nutrients and of the potash-nitrogen ratio to the Gooseberry. (Preliminary note).] *Ernähr. der Pflanze*, xxix, 18, pp. 339–346, 17 figs., 1933. [English summary on pp. 351–352.]

The results of pot experiments with Lady Delamare gooseberries at Weihenstephan, Bavaria, from 1929–32, indicated that leaf scorch is not primarily due to potash deficiency [*R.A.M.*, xii, p. 302], but rather to an unbalanced nitrogen : potash ratio leading to assimilatory disturbances.

Noble (R. J.). **Australia: success in control of bunchy top disease of Bananas in New South Wales.**—*Internat. Bull. of Plant Protect.*, vii, 9, p. 195, 1933.

In consequence of the rapid spread of bunchy top [see above, p. 78] the New South Wales banana industry declined from 650,000 bushels from 4,750 acres in 1922 to 91,144 bushels from 1,002 acres in 1925. However, thanks to the stringent quarantine and other control measures enforced by the Government in 1927 [see next abstract], the production figures have since gradually improved, reaching 515,140 bushels from an area of 4,733 acres for the year ending June, 1932.

Eastwood (H. W.). **Bunchy top control. Early identification, eradication of infective aphids, and destruction of diseased stools.**—*Agric. Gaz. New South Wales*, xliv, 8, pp. 611–614, 1 fig., 1933.

Full directions are given for the control of bunchy top of bananas in New South Wales [*R.A.M.*, viii, p. 585, and preceding abstract] by prompt detection of the symptoms: immediate and thorough spraying of diseased stools with power paraffin to destroy the aphid vectors [*Pentalonia nigronervosa*] of the virus; eradication of infected stools and their destruction by burning, preferably in the holes from which they are dug out. Additional precautions should include the application of a contact insecticide (e.g., 40 per cent. nicotine sulphate, or paraffin emulsion) to neighbouring stools: limitation of the number of plants and suckers per stool: wide spacing, clean cultivation, and other sanitary measures.

Park (M.). **The oil treatment of Plantain diseases.**—*Trop. Agriculturist*, lxxxi, 2, pp. 86–90, 1933.

A brief account is given of experiments in Ceylon, the results of

which showed that a light gas oil of specific gravity 0·864 and closed flashpoint 170/180° F., locally procurable from the Shell Company under the name Plantain Disease Oil at a comparatively low cost, was effective in killing in situ the roots of plantains affected with bunchy top [see preceding abstracts] or with Panama disease (*Fusarium* [*oxysporum*] *cubense*) [cf. *R.A.M.*, xi, p. 585]. The doses recommended are 1 pint for small and 2 pints for moderately large clumps (2½ to 3 years old), the cost of the oil used in the treatment averaging ten cents [1·8*d.*] per plantain stool.

Surridge (H. R.). **Annual report by the Agricultural Officer, 1932.**—*Dept. of Agric., Fiji, Ann. Bull. Divis. Repts. 1932*, pp. 1–22, 2 pl., 1933.

The following item of phytopathological interest occurs in this report. Heavy damage was again caused in the banana plantations, especially of Vitilevu, by the so-called 'Sigatoka' or leaf spot disease (*Cercospora musae*) [*R.A.M.*, ix, p. 739; x, p. 480], which caused a loss of some 60 per cent. of the total crop. At the Experiment Station the loss amounted to 100 per cent. It has yet to be determined whether the discoloration of the flesh of fruit at nearly all stages of growth associated with this disease is actually caused by it. Infection was checked to some extent by spraying in April, May, and June with half or full strength Burgundy mixture, combined with 2 per cent. raw or boiled linseed oil or with 2 or 3½ per cent. coco-nut oil.

Tomkins (R. G.). **The prevention of mould on stored fruit by the use of gases and volatile substances.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 65–66, 1933.

When English glasshouse tomatoes were stored at 12° C. and air currents containing, respectively, 12·5, 6, 3, and 1·5 c.c. of ammonia per 10.000 c.c. of air were passed over them, all the samples were sound after 26 days, though when similar samples were stored in air *Botrytis cinerea* appeared on the calyx after seven days, 50 per cent. of the fruits were attacked after 20 days, and they were all rotted after 26 days.

When wounded oranges inoculated with *Penicillium digitatum* were stored at 18° in air passed over 10 per cent. solutions of alcohol, green mould was not reduced; when the air was passed over 20 per cent. solutions of alcohol infection was considerably reduced, but the appearance and flavour of the fruit were impaired. Storage in air passed over 15 per cent. solutions of alcohol appreciably reduced the mould without seriously affecting the flavour [*R.A.M.*, xii, p. 34].

Lindblom (A.). **Sprutor och bepudringsapparater för bekämpning av parasiter å trädgardsväxter. De vanligaste kemiska medlen i växtparasitbekämpningens tjänst.** [Sprayers and dusting apparatus for the control of orchard parasites. The best-known chemical preparations for the control of plant parasites.]—*Statens Växtskyddsanst. Flygbl.* 3 & 4, 17 pp., 15 figs., 1 diag., 1933.

The first of these two leaflets gives notes on the construction,

method of working, cost, and other particulars of the various types of spraying and dusting apparatus used in Swedish orchards, while the second deals with the composition and application of some standard fungicides and insecticides (exclusive of those employed in the treatment of seed-grain).

DESRUE (A.) & CHASSET (L.). **Sur la préparation de la bouillie bordelaise.** [On the preparation of Bordeaux mixture.]—*Rev. de Vitic.*, lxxix, 2041, pp. 154–156, 1933.

The authors state that, as indicated by their experience, the mode of preparation of Bordeaux mixture [*R.A.M.*, xiii, p. 44] is of little importance where it is applied from sprayers working and refilled under high pressure, since in every case the mixture is thoroughly stirred up and kept in durable suspension in the process of refilling, this preventing the formation of a coarse deposit in the period of time necessary for the application of the quantity of spray contained in the sprayer. The same also applies to cupric sprays emulsified with a mineral oil.

VERMOREL. **Les hautes pressions en pulvérisation.**—[High pressures in pulverization.]—*Rev. de Vitic.*, lxxix, 2042, pp. 117–123, 7 figs., 1933.

The author points out that the pressure to be applied inside spraying apparatus must be carefully adjusted in accordance with many interconnected factors, chief among which are the nature, height, and density of the plants treated, their stage of seasonal growth, length of the spray-distributing hoses, and the like, the same applying, though to a lesser degree, to dusters using sulphur and other fungicidal or insecticidal powders. The paper also includes brief descriptions of several spraying and dusting apparatus (chiefly of his own construction) adapted for the treatment of different crops, and to the requirements of small land-holders or of large estates.

PALLIER (A.). **La résine colloïdale comme mouillant et fixatif.** [Colloidal resin as a wetting agent and adhesive.]—*Rev. de Vitic.*, lxxix, 2040, pp. 92–94, 1933.

In this brief note the author states that a colloidal emulsion of colophony has been recently produced in France, which in preliminary tests on the vine gave indications of considerably increasing the wetting capacity and adhesiveness of cupric sprays when added to the latter at the rate of 1 per cent. The emulsion does not coagulate in the spray, and in a small experiment vines sprayed with Bordeaux mixture containing it withstood well the action of very heavy rains, while control vines sprayed with the usual mixture were practically washed clean. The preparation is being further tested for spraying trees and kitchen-garden vegetables.

SORAUER (P.). **Handbuch der Pflanzenkrankheiten. Erster Band. Die nichtparasitären und Virus-Kranhheiten. Erster Teil. Sechste, neubearbeite Auflage.** [Handbook of

plant diseases. Volume I. The non-parasitic and virus diseases. Part I. Sixth revised edition.]—x + 592 pp., 107 figs., 1 diag., 6 graphs, 9 maps, Berlin, P. Parey, 1933.

This section of the sixth revised edition of Sorauer's 'Handbook of plant diseases', in the preparation of which Dr. O. Appel is assisted by Drs. Braun, Hiltner, Köhler, Merkenschlager, Morstatt, K. O. Müller, Pfeil, Schlumberger, Tiegs, and Wartenberg [cf. *R.A.M.*, xi, p. 527], is the first part of the first volume, which will include the non-parasitic and virus diseases.

The first (general) part of the work comprises a survey by Braun of the history of plant diseases and pests from the earliest times to 1880, and a general account by Morstatt of the science of phytopathology, treated under the aspects of the nature, symptoms, and causation of disease and the environmental factors involved in its development. In the second (special) part, Merkenschlager deals with plant nutrition and disease, including such metabolic disorders as heart and dry rot of beet [ibid., xii, p. 2], manganese deficiency of oats [ibid., xi, p. 363 *et passim*], and reclamation disease of cereals [ibid., xii, p. 86]; E. Hiltner with the causation of disease by climatic and meteorological factors, e.g., the die-back of firs [ibid., xii, p. 480], intumescences, and the like; and Wartenberg with the pathological effects of heat and cold, the latter associated, for instance, with the so-called 'Rhenish die-back' (apoplexy or gummosis) of cherry trees [ibid., xii, p. 575].

This section of Sorauer's well-known volume on the non-parasitic diseases has been entirely recast and brought up to date, and the special part contains much the most complete survey of the nutritional and climatic factors that injure plants hitherto available.

[Wallace (G. B.).] **Tanganyika Territory Department of Agriculture. Mycological leaflets 1, 2, 3, 4, 5, 6 (revised), 7, 9, 10, 12 [mimeographed], 13 (revised), 14.**—32 pp., 1930–33.

This is a series of popular leaflets on the more important plant diseases of Tanganyika, viz., coffee rust (*Hemileia vastatrix*), brown blight of coffee leaves (*Colletotrichum coffeanum*), brown eye spot of coffee (*Cercospora coffeicola*), damping-off of seedlings (*Rhizoctonia* sp.), die-back of coffee (mainly due to exhaustion), root diseases of coffee and other plants (*Armillaria* sp., *R. bataticola* [*Macrophomina phaseoli* and *R. lamellifera*], *Sclerotium rolfsii*, and *Bacterium tumefaciens*, the last named found on roses only, up to the present), 'cherry fall' of coffee (probably analogous with the 'black bean' disease in India) [*R.A.M.*, vi, p. 465], coffee bean disease (*Nematospora coryli*) [ibid., xi, p. 572], coffee bark disease (*Fusarium lateritium* var. *longum*) [ibid., xi, p. 711], coffee berry disease (*Colletotrichum coffeanum*), not yet known to occur in Tanganyika but prevalent in Kenya, and cereal diseases (the Kiswahili version of *Mycol. Circ.* 2, 4 pp. [mimeographed]). Leaflet 10 deals with the preparation of Bordeaux mixture and other fungicides.

Stevens (N. E.). **United States of America: disappearance of Zostera marina along the Atlantic Coast of North America.** —*Internat. Bull. of Plant. Protect.*, vii, 9, pp. 195–196, 1933.

The widespread disappearance of the grass-wrack or eel grass seaweed (*Zostera marina*) from the Atlantic coasts of the United States, France, and Holland has already been reported [*R.A.M.*, xiii, p. 46], and field observations made chiefly by members of the Biological Survey of the United States and the Biological Board of Canada indicate that extensive areas between Beaufort, North Carolina, and Nova Scotia were practically denuded during the summer of 1932. Considerable importance attaches to the loss of this staple winter food of various game birds. Throughout the affected coastal stretches are estuaries and river mouths (e.g., Upper Chesapeake Bay), in which the sea water is strongly diluted by fresh water, where *Z. marina* is still persisting in an apparently normal condition. Some of the areas which showed a vigorous new growth of seedlings in the early spring of 1933 were again almost denuded by June.

No evidence of parasitism has hitherto been obtained, as amongst the various organisms isolated from the affected plants none has been found to predominate.

Duncan (F. M.) & Cotton (A. D.). **Disappearance of Zostera marina.**—*Nature*, cxxxii, 3334, p. 483, 1933.

In the light of his extensive inshore collecting experiences with marine invertebrate fauna during the last ten years, the first author suggests that, at any rate as regards the English Channel, the widespread contamination of the water by the crude oil waste from ships and motor-boats may be a factor in the disappearance of the grass-wrack seaweed, *Zostera marina* [see preceding abstract]. Replying to this suggestion, A. D. Cotton regards the theory of oil pollution as untenable on the grounds of (1) the sudden dying-out of the seaweed over such a very wide area; (2) its general disappearance over the area in question irrespective of the degree of oil pollution; and (3) the continued existence of *Zostera* beds for many years in areas believed to be heavily polluted. In Europe, as in the United States, *Z. nana* is still abundant and apparently uninjured.

Ryjkoff (V. L.). Мутации и болезни хлорофиллого зерна. [Mutations and diseases of the chloroplast.]—192 pp., 74 figs., State Publishing Office 'Selkhozgiz', Moscow, 1933.

This book, a publication of the Ukrainian Institute for Plant Protection, is stated by the author in a brief introduction to be the first attempt in the Russian language to give a summary review of the results obtained up to date both in Russia and abroad in the study of the plant diseases and conditions involving a pathological or genetical modification of the chloroplast and leading to the partial or total loss of chlorophyll. In this account some of the author's own investigations are included, and an outline is given of the direction in which he believes further work should be prosecuted.

The book is divided into nine chapters, the first of which deals

very briefly with the normal structure and development of the plastids. In the second there is a comprehensive discussion of infectious chlorosis, mosaic, and related virus diseases, planned much on the same lines as those followed by K. M. Smith in his recent publication [*R.A.M.*, xii, p. 647]. In a brief summary of this chapter the author considers that the balance of evidence suggests that the various infectious agencies known as viruses partake more of the nature of inanimate substances, more or less related to catalysts or enzymes, than of that of living organisms. The third, fourth, fifth, and sixth chapters deal with the macroscopical and microscopical symptoms of non-infectious variegation (including total albinism) of various plants, and with the genetics of the inheritance of this condition. The seventh chapter discusses the pathological changes brought about in the plastids by physical and chemical factors, and also those caused by the action of parasitic organisms and the viruses. The eighth chapter deals with the physiological aspect of the pathological conditions of the chloroplasts, and the ninth with the bearing of environmental factors on the development of chlorophyll. The bibliography appended comprises over 425 titles.

Smith (J. H.). **Some aspects of virus disease in plants.**—*Empire Journ. Exper. Agric.*, i, 3, pp. 206–214, 1933.

Starting from the assumption that virus diseases of plants are steadily acquiring a wider distribution and greater intensity as compared with a generation ago, the writer concisely outlines some of the main problems awaiting solution in this field, with illustrations from contemporary researches. Foremost among the questions to be decided are the relationships between virus and insect vector and virus and host; the adoption of a system of classification; and the nature of the viruses, on which point the writer inclines to the 'living entity' view [cf. *R.A.M.*, xii, p. 308 and preceding abstract].

Chester (K. S.). **The problem of acquired physiological immunity in plants.**—*Quart. Rev. of Biol.*, viii, 2, pp. 129–154; 3, pp. 275–324, 1933.

The present paper is a critical analysis of the problem of acquired physiological immunity in plants [*R.A.M.*, xii, p. 779], the understanding of which is simplified by an opening section on immunological conceptions and terminology. None of the objections commonly raised to the possibility of the existence of acquired immunity in plants, i.e., differences between the circulatory system of the latter and that of animals, manner of growth, opportunity for sensitization, and reaction towards disease, has been found to be valid. It is considered to have been demonstrated by several lines of investigations that a form of immunity analogous with that acquired by animals may be developed in plants as a result of parasitism, the resistance to which on the part of plant hosts is, moreover, more satisfactorily interpreted on the basis of this theory than by any other explanation yet advanced. There is also considered to be strong evidence for a general occurrence of acquired immunity in symbioses throughout the entire plant kingdom.

An experimental analysis of the nature of acquired physiological immunity in plants indicates that the phenomenon is wholly or entirely manifested in the reactions of living cells.

The possibility of the practical application of the principles of acquired immunity is discussed, and a number of suggestions are made as to the direction of future studies in this field. The paper terminates with a bibliography of over 200 titles.

LINK (G. K. K.) & WILCOX (HAZEL W.). **Precipitin-ring test applied to fungi. II.**—*Bot. Gaz.*, xcv, 1, pp. 1–34, 1933.

A fully detailed and tabulated account is given of the writers' further studies on the applicability of the precipitin-ring test in the differentiation of certain groups of Fungi Imperfecti [*R.A.M.*, xi, p. 798].

Potent antisera and test antigens (giving maximum titres of 1 : 25,600) were prepared from 34 species and strains by using fractions of the powdered fungal mats soluble in 0·85 per cent. sodium chloride solution. Generally speaking, the cross precipitin reactions were too strong to permit of identification by this method, but in a limited number of tests members of the Pezizales (*Sclerotinia fructicola* and *S. sclerotiorum*) were differentiated from those of the Hypocreales (*Neurospora tetrasperma*, *Fusarium* spp., *Cylindrocarpon album*, and *Ramularia* sp.), some of which were in turn mutually distinguishable by their serological reaction. *S. fructicola* and *S. sclerotiorum*, and the plus and minus strains of *N. tetrasperma*, were differentiated by the precipitin absorption test. Many attempts to demonstrate specific precipitabilities for the saline extracts of *Fusarium* spp. gave negative results. In its present form, therefore, the precipitin-ring technique is scarcely adapted to the differentiation of all the forms separable by morphological and physiological (e.g., host and symptom specificity) criteria. However, a consideration of all the reactions of each of the organisms tested points to a distinct serological individuality in every case.

RANDS (R. D.) & DOPP (E.). **Humus extract agar favorable for oospore production in Pythium.**—*Phytopath.*, xxiii, 9, p. 745, 1933.

The addition of humus extract (so-called humic acid) from woodland and garden soils or from decomposed filter-press cake at the rate of 50 p.p.m. (organic content) to a medium of maize meal agar and grated carrot resulted in satisfactory oospore production by the agent of root rot of sugar-cane, *Pythium arrhenomanes* [*R.A.M.*, xi, p. 28], which ordinarily fails to develop this stage in culture. The extract was prepared according to the method described by Burt, Lineweaver, & Horner (*Soil Sci.*, xxxiii, pp. 413–453, 1932). Synthetic humic acids did not stimulate oospore production.

TOMKINS (R. G.). **The action of certain volatile substances and gases on the growth of mould fungi.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1932*, pp. 62–65, 1 graph, 1933.

After pointing out that certain volatile compounds and gases

such as hydrogen cyanide and hydrogen sulphide, which attack the respiratory mechanism of moulds, are quite distinct in their action from substances such as chloroform which inhibit cell division before respiration is seriously reduced [*R.A.M.*, xii, p. 46], the author described an experiment (made to ascertain directly whether inhibitors primarily attacking the respiratory centres retard growth in a particular way) in which *Rhizopus nigricans* was grown in low concentrations of oxygen (0·2 to 3 per cent.) and in carbon monoxide.

The results [which are tabulated, graphed, and discussed] showed that a concentration of 3 per cent. oxygen delayed the appearance of the colony and that still greater reduction increased this delay. Growth rate was also reduced, especially at first; after a period of slower initial growth a phase of constant growth set in.

The presence of carbon monoxide delayed the appearance of the colony and reduced the growth rate. The reduction in growth did not depend on the absolute concentration of the carbon monoxide, but was also determined by the amount of oxygen present. Mixtures of oxygen, carbon monoxide, and nitrogen in which the ratio of carbon monoxide to oxygen was the same tended to have approximately the same effect on growth. When the oxygen concentration was low the effect of a given mixture of carbon monoxide and oxygen was greater than it was at higher concentrations of oxygen. At high carbon monoxide to oxygen ratios the density of the mycelium was much reduced.

The manner in which decrease in tension of oxygen retards growth in many respects resembles that in which growth is retarded by hydrogen cyanide, hydrogen sulphide, and acetaldehyde [loc. cit.]. It is not, however, certain, that the retarding action of such substances is exactly equivalent to a reduction in the tension of oxygen. No simple classification of inhibitors by their action on the growth of moulds appears to be possible.

Development of seed Potato production in the Irish Free State, 1922–1932.—*Journ. Dept. Agric. Ireland*, xxxii, 1, pp. 81–84, 1933.

Since 1925 potato crops in the Irish Free State have been inspected for freedom from leaf roll and mosaic as well as blackleg [*Bacillus phytophthorus*], and in the same year arrangements were made by the Department of Agriculture to have the produce of certified crops packed in bags, examined, and sealed before dispatch. The following were among the conditions of certification laid down for growing crops in 1932, when 3,764 acres were certified. The crop must be absolutely free from leaf roll and contain no plants affected by mosaic in such a degree as to reduce their yielding capacity. All plants infected by blackleg must be dug out before certification. 'Rogues' must be dug out, not pulled, no certificates being granted in cases where the tubers are left in the ground. Special 'health' certificates will be issued only for crops grown not less than 50 yds. from other potatoes and showing complete freedom from both mosaic and leaf roll.

Köhler (E.). **Ein latentes Kartoffelvirus.** [A latent Potato virus.]—*Naturwissensch.*, xxi, 31, p. 578, 1933.

An externally healthy Erdgold potato plant at Berlin-Dahlem was found to contain a virus, which is termed E8, which was transmissible by rubbing to tobacco, again producing no apparent symptoms in this host. Other symptomless Erdgold plants tested did not contain the virus. The E8 virus may be readily detected in a tobacco plant with latent infection by rubbing the leaves with a mosaic virus of the X group [*R.A.M.*, xii, p. 648] which induces characteristic symptoms of a mixed infection. The vegetative progeny of latent-infected Erdgold plants subsequently inoculated with the virus H19 [ibid., xii, p. 586] showed marked symptoms of leaf curl, but when H19 alone was used to inoculate healthy Erdgold plants it remained latent without producing symptoms. The question whether E8 is a greatly attenuated Y virus is under investigation.

Eyer (J. R.) & Crawford (R. F.). **Observations on the feeding habits of the Potato psyllid (Paratrioza cockerelli Sulc.) and the pathological history of the 'psyllid yellows' which it produces.**—*Journ. Econ. Entom.*, xxvi, 4, pp. 846–850, 3 pl., 1933.

After a brief description of the symptoms of psyllid yellows of potatoes [*R.A.M.*, xii, p. 461], the writers give a preliminary account of their studies in New Mexico on the mode of feeding of the insect vector (*Paratrioza cockerelli*) and its effects on the plants.

The potato psyllid is primarily a leaf feeder, but a few individuals have been detected on the stems and petioles. The beak may pass between the cells or enter them, feeding being chiefly in the phloem parenchyma cells bordering the xylem in the larger veinlets, or in the companion cells and modified parenchyma forming the major portion of the vascular bundles in the smaller veinlets. The cells entered often collapse and the resultant cavities become filled with granular materials. Sections of diseased stems and petioles show abnormally large deposits of starch granules in the cortex.

It would appear that the feeding of *P. cockerelli* is not calculated to induce wholesale destruction or mechanical plugging of the vascular system. Translocation is immediately disturbed, however, by the phloem alterations, and these primary disturbances could readily become accentuated if there were an injection of some infectious principle or toxic enzyme.

Schmidt [E.]. **Die Züchtung Phytophthora-widerstandsfähiger Kartoffeln.** [The breeding of *Phytophthora*-resistant Potatoes.]—*Deutsche Landw. Presse*, lx, 38, pp. 485–486, 5 figs., 1933.

In connexion with the investigations already described on the breeding of potatoes for resistance to *Phytophthora* [*infestans*] in Germany [*R.A.M.*, xiii, p. 53], the writer reports an experiment in which weekly applications of Bordeaux mixture were given from early July to certain plots of Erstling [Duke of York] and some of the resistant early hybrids between *Solanum demissum* and

cultivated varieties, which had maintained their resistance even to the form of blight which has recently devastated the Ef. strains [loc. cit.], while others were left untreated for comparison. In both the sprayed and unsprayed plots the foliage of the resistant strains died off uniformly in the latter part of August, showing that blight was not a factor in the withering of the green parts, whereas the treated Duke of York plants remained green about three weeks longer than the untreated. For practical purposes, however, protraction of the normal vegetative period in early varieties is undesirable as it delays ripening and lessens the value of the early crop. Partial rather than complete resistance should, therefore, be the aim of selection in the case of early varieties. This would mean a sufficient retardation in the development of the fungus to preclude the sudden destruction of an entire crop in two to three days as commonly happens at present. With medium-early and medium-late varieties, however, the highest possible degree of resistance should be the standard of breeding requirements. In view of the failure of the Ef. strains, the existence at Streckenthin of this collection of *S. demissum* hybrids, in which early, medium, and late varieties are represented and blight-resistant strains in each group are available, affords an opportunity to carry on the work of breeding for resistance combined with commercial qualities, considerable progress in which has already been made.

Crosier (W.). **Culture of Phytophthora infestans.**—*Phytopath.*, xxiii, 9, pp. 713–720, 1 graph, 1933.

For ordinary purposes the best method of growing *Phytophthora infestans* in pure culture is on raw aseptic tuber plugs [*R.A.M.*, i, p. 253]. For abundant sporangial production the best results were obtained on slices of surface-sterilized potato tubers or on the foliage of plants, kept at a temperature of 18° to 20° C. if rapid sporangial formation is required or at 10° if the fungus is to be maintained for some time. After the lesions form the leaves are detached and incubated in a moist chamber whenever a crop of sporangia is required. The establishment of the fungus in the tuber slices proceeds at a range of 9° to 24°, with an optimum at 19° to 22°. The development of aerial mycelium may be expected within 2½ to 3 days at the optimum temperature and 100 per cent. humidity, but a slight decrease in the humidity retards it and a fall to below 90 per cent. prevents the process altogether. In tuber slices kept at 6° the amount of bacterial contamination was negligible; aerial mycelium seldom developed before 15 days, followed 5 days later by sporangia. The corresponding times for mycelial formation at 9°, 12°, and 15° were 12 to 14, 6 to 7, and 4 to 6 days, respectively.

A batch of Rural Russet tubers, artificially inoculated with *P. infestans*, was kept from October, 1931, to July, 1932, at a temperature of 4° to 6° and a relative humidity of 80 to 85 per cent. At the end of the period very little bacterial rot was apparent, though some of the tubers were nearly destroyed by the fungus. On placing the tubers in a saturated atmosphere at 18° abundant sporulation rapidly took place. The conditions employed in this test simulate those of ordinary winter storage.

The sporangia were found to germinate most profusely at 12° to 13° by zoospores (indirect germination) and at 24° by germ-tubes (direct germination). The range of indirect germination extends from 1° or below to 25° and that of direct germination from 6° to nearly 30°. In controlled humidity tests at 20°, 72 per cent. indirect germination was obtained when the sporangia were sown in water after an hour at 99 per cent. relative humidity, as against 45 per cent. at 90, 11 at 50, and 5 at 25. The sporangia of *P. infestans* germinate only in the presence of water, the addition to which of vaseline, bentonite [ibid., xi, p. 788], or infusorial earth stimulates the process. The zoospores may be maintained in a motile condition by holding the spore suspension at 3°. The zoospores germinate most abundantly at 15° and rapidly die at 26° or above. In inoculation work the foliage of the plants should be kept moist for at least 1½ hours at 20° to 25° (the optimum for penetration), 2 hours at 15°, and 2½ to 3 hours at 10°. The results of numerous experiments tend to prove that *P. infestans* spreads most rapidly in the field when the temperature favours indirect sporangial germination (12° to 13°).

Murphy (P. A.) & McKay (R.). **Tests of certain dusts and ready-made sprays for the control of Potato blight in comparison with Burgundy mixture.**—*Journ. Dept. Agric. Ireland*, xxxii, 1, pp. 30–48, 4 pl. (2 facing pp. 4–5), 1933.

In a series of trials [which are fully described and tabulated] from 1927 to 1930 at the Albert Agricultural College, Glasnevin, Dublin, on the relative merits of 2 per cent. Burgundy mixture and various dusts in the control of potato blight [*Phytophthora infestans*] on the Up-to-Date, British Queen, Golden Wonder, and Arran Victory varieties, the former proved more generally reliable and profitable, especially in seasons of severe infection. In years of milder attack the Niagara copper-lime dusts 6 and 25 (containing 19 and 24 per cent. monohydrated copper sulphate, respectively) sometimes produced a heavier and more lucrative crop when used in large quantities (100 lb. per acre) but not at the rate of 35 to 40 lb. per acre. The more concentrated 25 dust did not prove superior to 6. In the last year of the tests an English 20 per cent. copper hydrate powder, the active ingredient of which was the dried and ground precipitate of Bordeaux mixture, containing 20 per cent. copper, gave promising results at the rate of 15 to 20 lb. per acre. In 1931 and 1932 the liquid copper spray known as bouisol [see above, pp. 98, 104] was also included in the experiments. At the lower concentrations this preparation gave inadequate protection, and only at a strength of 10 lb. in 100 galls. were results obtained that approached, but still did not equal, those secured with Burgundy mixture. The principal weakness of bouisol appears to lie rather in its poor adhesive capacity and failure to persist on the leaves until the critical period in August than in any lack of fungicidal efficacy. Excellent results were obtained when two applications of bouisol were followed by a final treatment with Burgundy mixture, which possesses the combined advantages of permanency and of retarding undesirable growth in the later stages of vegetation.

Estimating the average loss from blight at 3½ tons per acre, valued at £12 5*s*., the cost of spraying must be kept within £12 per acre to secure a reasonable profit. The large increases of yield obtained in some of the writers' experiments are attributed chiefly to the liberal use of materials. A vigorous crop cannot be protected with less than 160 galls. of spray per acre and as much as 240 galls. may be necessary. The extra profits derived from plentiful applications were out of all proportion to the increased cost. Thus, an additional 5 cwt. of potatoes suffices to compensate for the difference in cost of materials between three heavy dressings with 2 per cent. Burgundy mixture (34*s*. per acre) and three at 1 per cent. (17*s*.), whereas an increase of over 1½ tons may usually be anticipated and in years of severe blight and high prices proportionately more both in quantity and value.

Austin (M. D.) & Martin (H.). **The incorporation of contact insecticides with protective fungicides. Potato field trials, 1930-1932.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxii, pp. 49–58, 1933.

Vegetable oils having proved effective fungicides against *Sphaerotheca humuli* on the hop, tests were made of combined vegetable oil and pyrethrum sprays at the South Eastern Agricultural College, Wye, Kent, in 1930, for the control of potato blight [*Phytophthora infestans*] and certain insects. These failed to control the blight.

A year later, copper-containing sprays suitable for heavy applications [see above, p. 105] were combined with the vegetable oils and a contact insecticide, the treatments given being Bordeaux mixture (10 : 15 : 100), the same with 0·75 per cent. concentrated sulphite lye (60° Tw.) and 0·02 per cent. nicotine, 1 per cent. cottonseed oil solution of pyrethrum extract emulsified with Bordeaux mixture (10 : 15 : 100), copper oleate 0·2 per cent. in solution in cottonseed oil emulsified at 2 per cent. by the two-solution oleic acid method [*R.A.M.*, xii, p. 576], and salicylanilide (Shirlan paste) [ibid., xiii, p. 10] at 1 per cent. in suspension in 0·25 per cent. agral I.

Only the Bordeaux mixture and its modifications gave effective blight control and they had no injurious effect on the leaves. The average yield of healthy tubers per row treated with Bordeaux mixture, Bordeaux-sulphite lye, cottonseed oil Bordeaux, and untreated was, respectively, 45, 46, 49·5, and 34·5 lb.

In 1932, in similar trials with the seed saved from the previous ones the average yields of healthy tubers per two rows were, respectively, 46·2, 50·3, 50·1, 47·5, and 48·3 lb. for the following treatments: no application, Bordeaux mixture (10 : 15 : 100), the same with 0·75 per cent. sulphite lye (60° Tw.) and 0·02 per cent. nicotine, half-strength Bordeaux mixture (5 : 7·5 : 100) used to emulsify cottonseed oil at the rate of 0·75 per cent. by volume, with 0·02 per cent. nicotine, and full-strength Bordeaux mixture used to emulsify a cottonseed oil solution of pyrethrum extract, the spray containing 0·75 per cent. cottonseed oil and 0·002 per cent. pyrethrins.

The failure to obtain from the treatments significant differences in the yield of healthy tubers suggests that yield may not be a

suitable criterion of fungicidal efficiency; in both years observations of the amount of disease in the haulms gave better indications of the comparative merits of the fungicides, while significant results were obtained when the seed from the plots was grown on, those sprayed with an insecticide-fungicide combination giving 4·3 lb. per two rows more in the second year than the unsprayed, presumably due to control of infestation with insects, including the vectors of virus diseases.

LINDFORS (T.). **Åtgärder för bekämpande av bladmögel och brunröta hos Potatis.** [Control measures against leaf mould and brown rot of Potatoes.]—*Statens Växtskyddsanst. Flygbl.* 6, 6 pp., 2 figs., 1933.

Directions are given in popular terms for the control of 'leaf mould' and 'brown rot' [blight: *Phytophthora infestans*] of potatoes in Sweden by the use of healthy seed, the cultivation of resistant varieties [*R.A.M.*, viii, p. 735], spraying with Bordeaux or Burgundy mixture, and the provision of suitable storage conditions.

SEIFERT (E.). **Weisshosigkeit (Rhizoctonia) bei Kartoffeln.** ['White leg' (*Rhizoctonia*) in Potatoes.]—*Deutsche Landw. Presse*, lx, 38, p. 486, 1933.

It is stated that the incidence of infection by *Rhizoctonia* [*Corticium*] *solani* on potatoes in Germany is much more frequent than might be expected from the practical absence of external symptoms. Occasionally the disease may be recognized by the formation of small tubers by seed potatoes either in storage or in the field before the mother plant produces leaves. Under such unfavourable conditions for the seedlings as prevailed in the spring of 1933, the 'eyes' begin to decay in the soil before reaching the surface. Knowledge regarding the control of this disease is urgently required.

HEMMI (T.) & WATANABE (T.). **Studies on the stem rot (split stem) of Sweet Potatoes.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 314–327, 1 pl., 1933. [Japanese, with English summary.]

The conidial characters of four strains of *Fusarium* isolated by the writers from rotted sweet potato stems in Japan are stated to resemble those of *F. batatatis* and *F. hyperoxysporum* [*R.A.M.*, xi, p. 535] and to differ from *Hypomyces* (*Nectria*) *ipomoeae* [ibid., ix, p. 736], to which the disease is commonly attributed. Inoculations with three of these strains showed that they are capable of splitting the stem and causing a localized brown discoloration when inoculated through wounds, but they did not spread extensively. In soil infection through wounds, the mycelium apparently spreads somewhat more freely in plants grown on dry soil than under humid conditions. The optimum temperature for infection in greenhouse tests was found to be 32° C., at which the incubation period was only 6 hours compared with 18 at 24° and 40° and 12 at 28° and 36°. Two of the strains under observation were able

to grow at a hydrogen-ion range of P_H 3·6 to 8·6 on potato decoction agar with 2 per cent. sucrose.

Hemmi (T.) & Endo (S.). **Studies on Sclerotium diseases of the Rice plant. VI. On the relation of temperature and period of continuous wetting to the infection of the Rice plant by Hypochnus sasakii Shirai.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 202–218, 1933. [Japanese, with English summary.]

The minimal periods of continuous wetting necessary for the infection of rice under experimental conditions by *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, xii, p. 331] were found to be about 18 hours at 32° C. and 24 at 28°. At 36° and 24° infection seems to be barely possible. In a series of inoculation experiments on full-grown plants in pots, the most severe infection occurred at 32°; at 28° the virulence of the disease was slightly, and at 24° greatly reduced, while at 36° no trace of infection was apparent. No conspicuous differences could be detected between the Japanese strain of *C. sasakii* and a Philippine collection of the same fungus referred by M. A. Palo to the *Rhizoctonia* [*C.*] *solani* group [ibid., vi, p. 253].

Sharples (A.). **Annual Report of the Pathological Division.**—*Ann. Rept. Rubber Res. Inst. Malaya, 1932*, pp. 94–102, 1933.

Further studies of the parasitism of *Fomes lignosus* on *Hevea* rubber trees in Malaya [*R.A.M.*, xii, pp. 52, 54] showed that the fungus does not enter through wounds, but directly penetrates the living, healthy bark. The distribution of the disease in a new clearing is governed by that in the previous stand at the moment of felling, and the method previously described [loc. cit.] of ascertaining this by using the trees as indicators proved highly successful in large-scale tests. The rhizomorphs travel only along hard surfaces; they expend some of the food reserves of the mycelial mass in covering the surface of each obstacle they encounter, so that the effective range of each centre of infection varies inversely with the concentration of obstacles in the soil. Infection tends to increase with partial clearing of the rotting timber in the soil, but a limit of increase is attained when further removal checks continuous expansion. Propagation by spore infection appears to be unimportant.

A very close parallel exists between the modes of origin, propagation, and attack of *F. lignosus* and *Ganoderma pseudoferreum* in rubber plantations. *G. pseudoferreum* spreads by means of rhizomorphs, from the under side of which the penetration of living tissues takes place through healthy bark. The rhizomorphs are creamy-white, the surface later hardening into a characteristic dark red skin, which becomes a bright wine-red colour when moist. The disease is generally distributed equally with *F. lignosus* in stands of all ages. Whereas, however, the numerical losses due to *F. lignosus* are high in young stands and low in mature ones, the reverse holds for *G. pseudoferreum*, the rhizomorphs and mycelium of which grow and produce tissue decay more slowly than those of *F. lignosus* and remain active long enough to enable

the fungus to attack the stand at a period when every facility is provided for rapid spread by root contact. The discovery that *G. pseudoferreum* kills seedling *Hevea* rubber enables the centres of infection to be traced and eliminated before they can cause any visible damage, and while treatment for *F. lignosus* is also in progress.

In 1932, the west coastal districts of Malacca, Negri Sembilan, and Perak sustained a heavy attack of *Oidium heveae* [ibid., xii, p. 323], though the rest of Malaya remained practically unaffected.

The practice of allowing belukar [secondary jungle or forest undergrowth] to grow up as cover on rubber estates entails great danger of increased virulence on the part of mouldy rot [*Ceratostomella fimbriata*: ibid., xi, p. 768], black stripe [*Phytophthora palmivora, P. meadii* and *P. heveae*: ibid., viii, p. 674], and pink disease [*Corticium salmonicolor*]. No direct proof, however, was obtained that this so called 'forestry' type of plantation favours the spread of root disease, the available evidence indicating the contrary.

Salmon (E. S.) & Ware (W. M.). **The downy mildew of the Hop in 1932.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxxii, pp. 108–119, 2 figs., 1933.

The most salient features of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xii, p. 354] situation in England in 1932 were the severe attacks which occurred on the crown of the 'hill' (rootstock) in winter and on the bine in early summer, and the check which the disease sustained later as a result of hot weather.

In one garden (planted with Bramling and Cobb hops) the disease was found during February to be killing the hills and roots. The mycelium was deep-seated in the tissues of the strap cuts, some of which were black and rotting, and was also present in roots 1 in. in diameter and in smaller roots to a distance of 6 in. from the point of origin. This is thought to be the first case of the kind recorded in England. Under the conditions prevailing in hop nursery beds, it is very probable that new hop gardens are planted up with material already seriously diseased.

Up to June the disease progressed steadily, but June was dry, sunny, and hot, and the angular leaf spot stage became suppressed. The subtending leaves at the nodes where lateral spikes were present were usually invaded through the petioles, spores being produced in lines adjoining the main veins. With warm, dry weather during the first three weeks of July little further spread occurred on the bine, the fungus dying out in most of the spikes left.

When terminal and lateral spikes had been removed complete control was given by three spray applications [ibid., x, p. 406]. Extra sprayings given by some growers before the bine had reached the top caused scorching of the young leaves, but no deleterious effects followed. Further evidence was obtained that spraying during burr is not injurious.

As there were 109 rainy days from April to September, 1932, but little loss from the disease, compared with 111 in 1927 when infection was severe, it is evidently not the total number of wet

days but the time of their occurrence in relation to the growth stage reached that influences attack by downy mildew.

HEMMI (T.) & KURATA (S.). **Studies on septorioses of plants. V. Septoria menthae (Thüm.) Oud. causing the serious leaf-spot disease of cultivated Mints in Japan.**—*Forsch. auf dem Geb. der Pflanzenkrankh.*, [Kyoto], ii, pp. 10–19, 6 figs., 1933.

Cultivated mints in Japan are stated to be widely and destructively attacked by *Septoria menthae*, which produces on both leaf surfaces circular or semicircular, dark brown or greyish-black, later white to greyish-white spots with a blackish-brown margin. The morphological and cultural characters of the fungus are described. Pycnidia and pycnospores are readily formed on potato decoction agar. The optimum temperature for growth appears to be about 24° to 28° C. Inoculation experiments on the leaves of French and German species of mints gave positive results after an incubation period of some twelve days.

Experiment Station notes. Cane diseases.—*South African Sugar Journ.*, xvii, 9, p. 465, 1933.

A few further cases of streak disease have been reported in P.O.J. 2725 sugar-cane on Reunion flats, Natal [*R.A.M.*, xii, p. 658], but the resistance of the variety appears to be considerable. Co. 281 has been found rather more susceptible to mosaic than Co. 290 or P.O.J. 2725, 2714, or 2878 under local conditions, and hence its release has been delayed. Here again, however, there is no reason to expect heavy losses from this source. The condition known in Cuba as 'cold chlorosis' [ibid., xii, p. 786] also occurs in Natal, chiefly on P.O.J. 2725, Uba being moderately susceptible and P.O.J. 2714 and 2878 apparently immune.

MCINTOSH (A. E. S.). **Report of the Geneticist for the year 1932–33.**—*Barbados Agric. Journ.*, ii, 3, pp. 1–32, 2 diags., 1933.

In a further test of the resistance of sugar-cane varieties to *Bacterium vascularum* in Barbados [*R.A.M.*, xi, p. 75], it was found that, judging by the leaf symptoms, susceptibility appeared to be greater in the Barbados commercial varieties and seedlings (Ba. 11569 being the most affected) than in the Javanese varieties of the P.O.J. series (crossings of *Saccharum spontaneum* and *S. barberi* with noble canes), or the Indian (Coimbatore) varieties, or crosses between the Javanese and Barbados varieties. A high percentage of the seedlings from Ba. 11569 × B.H. 10 (12) showed only slight leaf symptoms, the reverse being the case among seedlings derived from Ba. 11569 × Ba. 6032.

In March, 1933, seven to eight weeks after potting, groups of sugar-cane seedlings developed a stunted, withered appearance and a characteristic shortening of the young inner leaves. As the disease progressed, the leaves turned yellowish-brown and withered. The root systems of the affected plants were greatly reduced, frequently discoloured and rotten, and showed the presence of one or more fungi (probably introduced in the potting soil), to which the disease was attributed. By 5th April, some 2,200 seedlings or

12·2 per cent. of the whole had been killed off. As growth progressed the disease became less serious, and after the plants had been transferred to the field no further losses occurred.

COOKE (D. A.). **Relation of Pythium disease to growth failure.** —*Repts. Assoc. Hawaiian Sugar Technologists*, xii, pp. 169–178, 1933. [Abs. in *Facts about Sugar*, xxviii, 12, p. 471, 1933.]

The apparent stimulatory effect of chlorpicrin [see above, p. 98] on the yield of sugar-cane in certain Hawaiian soils has been found to be due to its toxic action on soil fungi, especially the *Pythium* attacking the D. 1135 and P.O.J. 36 varieties [*R.A.M.*, xii, p. 723].

AVERNA-SACCÁ (R.). **Contribuição para o estudo da biologia da Thielaviopsis paradoxa (de Seynes) Höhn., da Bananeira e da Canna de Assucar e sua pretensa relação com o Melanconium sacchari, Massee.** [A contribution to the study of the biology of *Thielaviopsis paradoxa* (de Seynes) Höhn. from Banana and Sugar-Cane and its supposed relationship with *Melanconium sacchari* Massee.]—*Rev. Agric.*, vii, 3–4, pp. 114–130, 13 figs., 1932. [Received November, 1933.]

A full account is given of the writer's studies in Brazil on the biology of *Thielaviopsis* [*Ceratostomella*] *paradoxa*, a pathogen of banana and sugar-cane, with notes on the observations of other workers in the same field. No evidence could be obtained in support of the alleged relationship between this fungus and *Melanconium sacchari*, associated with rind disease of sugar-cane [*R.A.M.*, xi, pp. 542, 543].

SĂVULESCU (T.) & SANDU-VILLE (C.). **Beiträge zur Kenntnis der Micromyceten Rumäniens.** [Contributions to the knowledge of the micromycetes of Rumania.]—*Hedwigia*, lxxiii, 3–4, pp. 71–132, 1933.

Of the 200 species of fungi (mostly Fungi Imperfecti, with a few Ascomycetes) included in this annotated list (bringing the total micromycetes described in Rumania to 342), 25 are described as new and are furnished with Latin diagnoses. A few new forms and varieties are also included.

BLUMER (S.). **Die Erysiphaceen Mitteleuropas mit besonderer Berücksichtigung der Schweiz.** [The Erysiphaceae of Central Europe with special reference to Switzerland.]—*Beitr. zur Kryptogamenflora der Schweiz*, vii, 1, 483 pp., 125 figs., 1 diag., 41 graphs, 1933.

This comprehensive and well illustrated monograph contains, in addition to full descriptions of the Central European (especially Swiss) Erysiphaceae, lists of the principal foreign species of each genus [cf. *R.A.M.*, vi, pp. 124, 643, *et passim*], the perithecial dimensions of many of the described forms on different hosts being shown graphically. Keys are given for the identification of the Central European species.

In the genus *Phyllactinia* Salmon's varieties *subspiralis*, *rigida*, and *angulata* of *P. corylea* [ibid., xii, p. 395] are raised to specific rank, bringing the total number of species referable to this genus to ten, in place of the single one recognized by Salmon.

Host and fungus indices and a 25-page bibliography are appended.

Reinking (O. A.) & Manns (M. M.). **Parasitic and other Fusaria counted in tropical soils.**—*Zeitschr. für Parasitenkunde*, vi, 1, pp. 23–75, 2 figs., 1933. [German summary.]

A detailed and fully tabulated account is given of the writers' investigations of 15 soils of Honduras and Guatemala (of which 14 were distinct types) for the presence and numbers of parasitic and saprophytic species of *Fusarium*. The methods of sampling and plating are described. The isolations were made on ordinary acidified potato agar (P_H 4 to 4·5).

Fifteen different species and nine varieties or forms, belonging to eight sections (but the majority in *Elegans*), were isolated from the various soil types. Practically all the surface soils yielded *F. dimerum* [*R.A.M.*, xi, p. 709], *F. equiseti* var. *bullatum* [ibid., xiii, p. 3], *F. moniliforme* [*Gibberella moniliformis*], *F. bulbigenum* [ibid., xii, p. 317], *F. oxysporum* form 5, *F. solani* var. *martii* f. 1, and *F. javanicum* var. *theobromae* [loc. cit.]. *F. oxysporum* f. 3 [formerly *F. cubense*: ibid., x, p. 626; xii, p. 773] occurred only in the soil surrounding diseased bananas but was found in 12 of the 14 soil types. *F. solani* vars. *minus* [ibid., xi, pp. 695, 709] and *eumartii* were commonly found at greater depths. All the foregoing except *F. oxysporum* f. 3 are provisionally classified as soil-inhabiting species of *Fusarium*, whereas *F. decemcellulare* [*Calonectria rigidiuscula*: ibid., vi, p. 440], *F. chlamydosporum*, *F. semitectum* [ibid., xii, p. 317], *F. camptoceras*, *F. diversisporum*, *F. scirpi* [ibid., xi, p. 504] and its var. *caudatum*, *F. moniliforme* var. *majus*, *F. orthoceras* and its var. *trisepatum* [ibid., x, p. 795], *F. oxysporum*, *F. vasinfectum* var. *lutulatum*, and *F. javanicum* var. *ensiforme* are regarded, by reason of their scarcity and the special local conditions governing their isolation, as mere soil invaders.

Larger average numbers of *F. dimerum* were isolated from the heavier soils, while the six other common species (including *F. oxysporum* f. 3) studied from this standpoint predominated in the soils of lighter texture. The following preferred alkaline soils: *F. dimerum*, *F. equiseti* var. *bullatum*, and *F. solani* var. *martii* f. 1, whereas an acid reaction promoted the growth of *G. moniliformis*, *F. bulbigenum*, *F. oxysporum* 3 and 5, and *F. javanicum* var. *theobromae*.

As mentioned above, *F. oxysporum* f. 3 was isolated, both in these studies and in numerous experiments in various parts of the Caribbean region, exclusively from the soil round diseased bananas. It is apparently a soil invader and a definite parasite, probably introduced into the areas under observation on diseased bananas from the Far East. *F. oxysporum* f. 5 and *F. bulbigenum* were originally described as agents, respectively, of tobacco wilt and bulb rot, but in the present investigations they were common

apart from their hosts, so that no high degree of specialization is indicated.

GIKASHVILI (K. G.) & VARTHAGAVA (T. I.). Грибы, собранные на Чайном кусте на Чаквинских плантациях и в окрестностях Чаквы в период с **23/V** до **23/VI 1930** г. [Fungi collected on the Tea bush on the Tschakva plantations and in the vicinity of Tschakva from 23rd May to 23rd June, 1930.]—*Bull. Res. Inst. for the Tea Indus. in U.S.S.R.*, Tiflis, 2, pp. 11–24, 1931. [Received November, 1933. In the Russian language with Georgian translation, and English summary.]

This is an annotated list of 18 species of fungi which were collected by the authors in the early summer of 1930 on the tea bushes in and around Tschakva [cf. *R.A.M.*, viii, p. 814; ix, p. 412]. In addition to those previously enumerated the list includes *Leptosphaeria cavarae*, *Ascochytella theicola* [ibid., vi, p. 127], and *Phoma ejiciens* Pass., which are stated to be new records for the Caucasus; and also *Phyllosticta theicola* [loc. cit.], *P. plurivora* Woron., *Macrophoma theae* [ibid., viii, p. 204], *Phomopsis theicola* [ibid., ix, p. 564], *Stagonospora theicola* Petch, *Ramularia theicola* [ibid., vi, p. 127], and *Cercoseptoria theae* [see next abstract].

NAGORNY (P. I.) & ERISTAVI (E. M.). Новая для Кавказа болезнь Чайного куста, вызываемая грибком **Cercoseptoria theae** (**Cav.**) **Curzi.** [A new disease of the Tea bush in the Caucasus, caused by *Cercoseptoria theae* (Cav.) Curzi.]—*Bull. Res. Inst. for the Tea Indus. in U.S.S.R.*, Tiflis, 2, pp. 3–10, 1 pl., 1931. [Received November, 1933.—Summaries in the Georgian and English languages.]

A brief account is given of the tea leaf spot caused by *Cercoseptoria theae* [*R.A.M.*, ix, p. 564] which was observed for the first time in 1928 and again in 1930 in a few tea plantations (exclusively on plants imported from Asia) in Georgia [Transcaucasia]. The macroscopical symptoms of the disease entirely agree with Curzi's description [loc. cit.], as do also the morphological details of the fungus, with the exception that the Caucasian fungus is stated to have somewhat longer conidia (up to 80 μ), consisting occasionally of as many as 10 cells. *C. theae* was for the most part found in association with other fungi, but a closer study showed that it never appeared on the spots primarily caused by another species, while some of the latter frequently developed as secondary infections on the spots caused by it. The disease was especially prevalent in 1930, when it caused fairly severe defoliation of the attacked bushes.

MOORE (E[NID] S.). **The kromnek or Kat River disease of Tobacco and Tomato in the East Province (South Africa).**—*S. Africa Dept. of Agric. Sci. Bull.* 123, 28 pp., 8 pl., 1 chart, 1933.

In the Stockenstrom district of the Eastern Cape Province, South Africa, increasingly serious losses are caused by a virus disease of tobacco known locally as 'kromnek' or Kat River wilt. Virginian tobaccos, which have been grown in the locality for over forty

years, were affected by a 'wilt' in 1905 which, from the published description (C. P. Lounsbury, 'Tobacco wilt in Kat River Valley', *Agric. Journ. Cape of Good Hope*, xviii, pp. 1–22, 1906), was probably the same disease.

The most constant of the extremely variable symptoms of kromnek is stunting. With seedlings, the growth of the whole plant is arrested but in older plants the lower leaves may continue slightly to enlarge, the arrest of the apex and the half-grown leaves resulting in a deeply sunken crown, while the individual leaves, owing to cessation of elongation affecting the midrib before the rest of the blade, become longitudinally 'gathered'. One-sided distortion of the leaf is common as a result of arrest of growth on one side only of the midrib. Twisting may also occur, so that the under surface of the leaf faces upwards. The apex of the stem is often bent over at right angles. Occasionally, as a late symptom especially on larger plants of the yellow type, sunken streaks appear on the stem, while the pith may show dark flecks forming a winding pattern like the trail of an insect, though later they coalesce into a uniformly dark grey area and cavities develop, separated by disks of darkened pith tissue. There is no obvious discoloration of the xylem. Affected Burley tobaccos sometimes show a naked stem and a crown of arrested bud leaves; in other varieties the leaves below the point of infection are retarded, yellow, and brittle. The first leaf above this point may appear normal, but the second and subsequent leaves develop ring spot or vein markings, or both, the youngest bud leaves becoming mottled. Kromnek is worst in early summer, both in the seed-beds and among young transplants, those planted out in November sometimes showing up to 95 per cent. diseased, while January plantings are usually free from infection. Yellow varieties are the most susceptible.

The disease was shown by transmission experiments to be due to a virus and further experiments indicated that a destructive disease of tomatoes in the same locality is due to the same virus. The first symptom on tomatoes is the rigidity and peculiar dull grey-green of the upper leaves; the rachis becomes recurved and the leaflets are inrolled upwards. Apical growth ceases, the short internodes producing a bunched effect accentuated by the forced development of the lateral shoots. Sunken necrotic spots and streaks develop later in the cortex of the rachis and stem. Fully grown leaves remain normal but younger ones may be malformed, with deeply sunken veins, the surface between being blistered and uneven. The under surface of the young leaflets is often purple, while rather older leaves are sometimes bronzed and may develop a uniform scorching. After being arrested for a few weeks the plants generally resume growth, the new leaves often being misshapen and puckered and sometimes mottled and blistered. Undersized fruits free from markings may be produced. In tomatoes grown under shade bronzing is usually absent and bunching less obvious; they make fair growth and may set a moderate crop. In seed-bed attacks the writer has seen 100 per cent. loss in seedlings a few inches high. All the varieties tested appeared to be equally susceptible.

Kromnek tobacco grafted on to healthy tomato produced symptoms typical of the tomato disease, and conversely. Tobacco kromnek was not transferred to tomato by juice inoculation, but the reverse inoculations were successful, severe and characteristic symptoms appearing in a few days. As the juice of tobacco plants inoculated from tomato produced systemic infection on other tobacco plants when rubbed on to them, and this was the only instance out of very numerous attempts in which infection was passed by means of juice inoculation from diseased to healthy tobacco, the virus appears to be more virulent when extracted from tomato than when obtained from tobacco. Juice inoculations from tomato to tomato are fairly easily obtained.

From the published description, tomato bunchy top in the eastern Transvaal [*R.A.M.*, xi, p. 481] resembles kromnek except for the absence of bronzing and leaflet rolling and differences in the necrotic leaf markings. Tomato spotted wilt in Australia and England [ibid., xi, p. 549; xiii, p. 8] is also very similar to the South African tomato disease in symptoms, general behaviour, and host range, but the symptoms on some hosts are different.

Experiments showed that tobacco kromnek is not seed- or soil-borne, but both the tobacco and the tomato disease are transmissible by grafting, and by an undetermined species of *Frankliniella* which is the chief, and possibly the only, source of spread in the field. The natural hosts of the virus, as shown by grafting and insect transmission experiments from diseased plants found in the field, include *Datura stramonium*, *Nicandra physaloides*, *Physalis minima*, *P. peruviana*, and *Solanum nigrum*; *S. pseudocapsicum* and potato were infected artificially.

Spread appears to be checked by high temperatures. Partial recovery is not uncommon, but the virus was ascertained by grafting to be present in the new growth of 'recovered' tobacco plants and they may later develop fresh kromnek symptoms [ibid., x, p. 614].

Some control is given by making the tobacco seed-beds late and deferring the first planting until late November or December; meantime, attempts are in progress to develop a resistant variety.

Woods (M. W.). **Intracellular bodies associated with ring-spot.**—*Contrib. Boyce Thompson Inst.*, v, 3, pp. 419–434, 2 figs., 1933.

Intracellular bodies, closely resembling those associated with other virus diseases of plants, were found by the writer at College Park, Maryland, in the cells of the primary and systemic lesions of ring spot in Turkish tobacco and the primary lesions in Havana Seed-leaf tobacco, *Nicotiana rustica*, *N. glutinosa*, and *Petunia* sp. [*R.A.M.*, xii, p. 120]. The bodies are uniform, spherical or oval, densely granular, vacuolate, and contain numerous minute, apparently crystalline, cuboidal bodies, staining vividly with safranin. They are confined to the visibly lesioned areas included within one or two necrotic rings in which cellular disintegration is in active progress. The rapidity of development of the intracellular bodies after inoculation seems to depend rather on the metabolic condition of the host cells than on the length of time that the cells remain exposed to the virus. The purity of the virus in the affected plants was demonstrated by tests, details of which are given. The

bodies are considered to represent the formation and accumulation of certain materials in the cytoplasm of the diseased cell, which generally congregate near the nucleus. They were observed with and without membranous peripheries in both young and old lesions.

MOORE (ENID S.). **Wildfire of Tobacco on Nicandra physaloides.**—*Nature*, cxxxii, 3335, p. 517, 1933.

Attention is drawn to the detection, in the late summer of 1932, of spontaneous infection by wildfire (*Bacterium tabacum*) on the annual Solanaceous weed, *Nicandra physaloides*, in the tobacco plantations at Balfour, East Cape Province, South Africa. The spots on the leaves are rounded, 1·5 to 10 mm. (average 6 to 7 mm.) in diameter, dull brown with a dark edge, usually concentrically zonate but devoid of the well-marked halo characterizing the wildfire lesions on tobacco. Inoculation experiments with the organism from *N. physaloides* produced the typical symptoms on the same host and on tobacco, the latter showing the characteristic halo. The bacterium was re-isolated from both plants and re-inoculated into tobacco and *N. physaloides* with positive results. The similarity of cultural features leaves no doubt as to the identity of the organism.

ADAM (D. B.). **Blue mould of Tobacco. On the morphology of the fungus and its nomenclature.**—*Journ. Dept. Agric. Victoria*, xxxi, 8, pp. 412–416, 1 fig., 1933.

In giving a critical summary of the literature dealing with species of *Peronospora* on *Nicotiana* spp., the author states that the first record of a fungus of this genus on tobacco in Queensland was made by Tryon in 1890, Cobb a year later describing it as apparently the same as *P. hyoscyami*, a name which is also applied to the Australian specimens of tobacco mildew in the Kew Herbarium. In Gäumann's Monograph [*R.A.M.*, iii, p. 241], however, all the records of *Peronospora* on *Nicotiana* are considered to be referable to *P. nicotianae* Speg.

A detailed morphological description is given of the fungus causing the blue mould disease of tobacco in Australia [ibid., xi, p. 408]. In freshly collected material only the conidial stage has been found, but badly mildewed leaves developed the previously unknown sexual spores on keeping in the dark for a fortnight, and these organs have since been repeatedly obtained by keeping the leaves very moist in Petri dishes. The fungus differs from *P. nicotianae* [ibid., iv, p. 573] in the shorter and less acute ultimate branchlets of its conidiophores, its larger conidia (22 by 17, as against 19 by 10 μ), its smaller oospores (35 to 60, compared with 50 to 80 μ in Spegazzini's species, material of which was obtained for comparison), with a smooth or slightly roughened epispore whereas that of *P. nicotianae* is closely and regularly warted or areolate. The oospores of the Australian fungus are distinctly larger than those of *P. hyoscyami* as described by Bakhtin [ibid., vii, p. 270; cf. also xii, p. 732], and it failed to infect *Hyoscyamus niger* under controlled conditions. For these reasons the Australian fungus is considered to be a distinct species and is named *P. taba-*

cina n. sp., a Latin diagnosis being appended. In artificial inoculation experiments the fungus was found to cause infection on tobacco, *N. glauca*, *N. suaveolens*, *N. rustica*, and *N. longiflora*, that is on all the species of this genus which were tested, and it is mentioned that McAlpine recorded '*P. hyoscyami*' on *N. suaveolens* in 1899 and considered that it had spread to the introduced tobacco from this native host.

Ogilvie (L.). **Ring spot or spotted wilt of Tomatoes and ornamental plants.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 121–122, 2 pl., [1933].

In 1932, spotted wilt of tomatoes [*R.A.M.*, xii, p. 59; see also above, p. 131] was present in at least two localities in Somerset. In one greenhouse it was found on *Streptosolen jamesonii*, *Schizanthus* sp., *Browallia speciosa major*, *Trachelium* sp., begonias, and *Campanula pyramidalis*. In a commercial nursery a large number of dahlias were affected. Attention is drawn to the possibility of widespread dispersal by the sale of such plants.

Rischkow (V.), Karatschevsky (J.), & Michailona (P.). **Ueber die Fruchtverholzung bei Tomaten. Vorläufige Mitteilung.** [On the woodiness of fruit in Tomatoes. Preliminary note.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 495–498, 1933.

A brief description is given of a disease of tomatoes, believed to be a previously undescribed virus disease, in the Crimea, characterized by 'woodiness' of the fruit, as reported [from Australia] in passion-fruit [*Passiflora edulis*: *R.A.M.*, xiii, p. 44]. The leaves of young shoots turn white under the influence of the disease (locally known as 'stolbur'), which further induces an abnormal elongation of the sepals and proliferation of the ovules [cf. ibid., xiii, p. 62]. In these particulars the tomato disorder, probably a representative of the 'yellow' group, resembles the teratological manifestations described by V. Ghimpu and D. Kostoff on virus-infected tobacco [ibid., xii, pp. 581, 728], and the authors observed a severe outbreak of a similar condition in tobacco coincident with the development of the tomato disease. 'Woody' tomato fruits and stems show an abnormally extensive development of the lignified tissue of the vascular bundles and especially of the pericyclic fibres, and other anatomical modifications. The carbon-nitrogen quotient of diseased plants is larger than in healthy ones, amylase activity also being higher in the former. The infectivity of the disease was demonstrated by successful grafting experiments; it is probably disseminated by insects in nature.

Schmidt (M.). **Zur Entwicklungsphysiologie von Cladosporium fulvum und über die Widerstandsfähigkeit von Solanum racemigerum gegen diesen Parasiten.** [On the physiology of development of *Cladosporium fulvum* and on the resistance of *Solanum racemigerum* to this parasite.]—*Planta*, xx, 3, pp. 407–439, 21 figs., 1933.

Continuing the studies initiated by R. v. Sengbusch and N. Loschakowa-Hasenbusch on the factors governing the resistance

of tomatoes to leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xii, p. 250], the writer undertook a further series of investigations at the Kaiser Wilhelm Institute for Breeding Research, Müncheberg, Mark Brandenburg, on the physiology of the fungus and the nature of resistance to it in *Solanum racemigerum*.

The fungus was grown on a number of media, full details of the cultures being given. On citric acid (2 per cent.) agar no spores germinated. In leaf decoctions of Bonny Best sporulation took place but no spores were produced in those of *S. racemigerum*, though there was some spore production in the latter when 2 per cent. agar was added, due apparently to the failure of the preventive mechanism in contact with the solid. In the leaf decoctions of Bonny Best and certain other varieties, e.g., Plum-shaped Yellow and Danish Export, and in the expressed sap of the leaves, stem, and roots of the first named, the hyphae assumed a remarkable antlered appearance and failed to attain the normal length. No spores germinated in the sap of *S. racemigerum* but hyphae of the Bonny Best type and normal spores were produced in root decoctions of *S. racemigerum* and a few germinated in decoctions of the stem of this species. The spores of *C. fulvum* did not germinate in decoctions from the ripe fruit either of susceptible varieties or of *S. racemigerum*, but normal hyphae developed in the expressed sap of the fruit flesh and fruit wall of both Bonny Best and *S. racemigerum*. In unripe and semi-ripe fruit decoctions the hyphae were of the antlered Bonny Best type. In leaf decoctions of the cultivated potato, *S. demissum*, *S. chacoense*, *S. neoweberbaueri*, and *S. wittmackii* antlered hyphae were produced, whereas the normal type developed in tuber decoctions of *S. tuberosum* and in a decoction of *S. muricatum* leaves. The ordinary long, slender hyphae of *C. fulvum* were further formed in tobacco leaf decoctions, while a tendency to antlering was shown in those of *Nicotiana affinis*. Normal hyphae developed in decoctions of the seven non-Solanaceous plants tested.

Tests to determine if the production of the antlered hyphae was connected with the presence of solanin showed that this substance in a pure form prevents germination at high concentrations and causes antlering of the hyphae produced by the germ tubes at low ones. On the precipitation of solanin out of Bonny Best leaf sap by means of tannin, normal hyphal formation occurred in the filtrate. The addition of manganese sulphate entirely counteracted the effects of solanin in the unripe fruit decoction of Bonny Best tomatoes and permitted the formation of typical hyphae. Atropin and saponin both exerted a similar action on *S. racemigerum* sap; the former stimulated germination in tobacco decoction and the latter in all the media used. The gradual dilution of solanin-containing substrata by those of the type producing normal hyphae led to a corresponding transition from the antlered to the typical form.

The anti-germination principle residing in *S. racemigerum* (which contains no more solanin than Bonny Best so that this substance cannot be responsible) is temporarily named 'prohibitin' and is a water-soluble substance, the physiological efficacy of which is counteracted by 20 to 30 minutes' heating to a temperature of

100°, as well as by precipitation of the leaf decoction with tannic acid.

MAXWELL (H.). **The Sycamore fungus.**—*Nature*, cxxxii, 3332, p. 409, 1933.

Attention is drawn to the absence from sycamore (*Acer pseudoplatanus*) plantations at Corrour, Inverness-shire (1,200 to 1,400 ft. above sea level) of the leaf blotch fungus *Rhytisma acerinum* [*R.A.M.*, xi, p. 547], which is constantly present on the trees elsewhere, being apparently regarded almost as a natural feature. The groves under observation are only 20 to 30 years old, the ground having been practically treeless before the experimental plantings were made.

DEMAREE (J. B.). **Progress of Pecan roset control.**—*Proc. 27th Ann. Convent. Georgia-Florida Pecan Growers' Assoc.*, pp. 38, 40, 42–43, 45, 1933. [Abs. in *Chem. Abstracts*, xxvii, 22, p. 5880, 1933.]

Zinc sulphate, applied to the soil or placed in holes in the trunks of pecan [*Carya pecan*] trees towards the end of March or early in April, largely prevented the development of rosette [*R.A.M.*, xii, p. 602], die-back, and leaf-spotting fungi [e.g., *Cladosporium effusum* and *Mycosphaerella dendroides*: ibid., xi, p. 213]. Spraying with the same preparation gave only temporary benefit.

HEMMI (T.). **On Stereum induratum Berk. and Trametes dickinsii Berk. causing dry-rot of Fagaceous woods.**—*Forsch. auf dem Geb der Pflanzenkrankh.*, [Kyoto], ii, pp. 328–333, 1 pl., 2 figs., 1933. [Japanese, with English summary.]

Notes are given on the results of the writer's studies in Japan on the wood-rotting fungi, *Stereum induratum* and *Trametes dickinsii*, of which the former is widely distributed round Kyoto and in Shikoku and causes a white pocket rot of oaks (*Quercus gilva*, *Q. stenophylla*, and *Q. myrsinaefolia*). The pockets are scattered throughout the wood and are filled with snow-white cellulose fibres, while the intervening network of sound tissue is comparatively thin. *T. dickinsii* is the agent of a brown, cubical rot apparently confined to the Fagaceae, represented in the writer's collection by oak, chestnut, beech, and *Pasania*.

FRITZ (CLARA W.) & ROCHESTER (G. H.). **Red stain in Jack Pine. A comparative study of the effect of Trametes pini and a second red-staining fungus on the strength of Jack Pine.**—*Dept. of the Interior, Canada, Forest Service Circ.* 37, 15 pp., 2 pl., 4 graphs, 1933.

Jack pine [*Pinus banksiana*], an important timber for railway sleepers in Canada, is liable throughout its entire geographical range, from the east coast to the middle west, to a disease known as 'red stain' which may be caused either by *Trametes pini* or by an as yet unidentified organism provisionally named fungus No. 2 [*R.A.M.*, xii, p. 344]. The former eventually produces a white pocket rot (after six to nine months in the malt agar culture experiments herein described), while the action of the latter is

apparently confined to discoloration of the wood. The colour of the stains caused by both the fungi ranged from red to orange with an admixture of neutral grey, that of No. 2 tending to be more vivid than that of *T. pini*.

A study of 444 pine blocks showed that 12 months' exposure to *T. pini* results in a considerable reduction both of strength in compression parallel to grain and in specific gravity, the former effect being noticeable after three months while the latter only became apparent after six months. No adverse effects followed the exposure of the blocks to fungus No. 2 under comparable conditions.

Some evidence was obtained that selection of *P. banksiana* for resistance to decay may be based on a rapid growth rate (12 to 16 rings per in.), but this cannot yet be taken as conclusive.

TUBEUF [C. v.]. **Studien über Symbiose und Disposition [für Parasitenbefall] sowie über Vererbung pathologischer Eigenschaften unserer Holzpflanzen. IV. Disposition der fünfnadeligen Pinus-Arten einerseits und der verschiedenen Ribes-Gattungen, Arten, Bastarde und Gartenformen andererseits für den Befall von Cronartium ribicola.** [Studies on symbiosis and tendency to parasitic infection and on the inheritance of pathological characters in our woody plants. IV. The tendency of the five-needled species of Pine, on the one hand, and of the various genera, species, hybrids, and horticultural forms of *Ribes*, on the other, to attack by *Cronartium ribicola*.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 433–471, 1933.

On the basis of five years' experiments in Germany [the results of which are fully discussed and tabulated] and of a study of the relevant literature, the writer has compiled a survey of the varietal reactions of currants, gooseberries, other species of *Ribes*, and five-needled pines to blister rust (*Cronartium ribicola*) together with a note on the varietal susceptibility of gooseberries to American mildew (*Sphaerotheca mors-uvae*) in 1931–2. Keys are given for the determination of the pines belonging to the sections *strobus* and *cembra*.

TUBEUF [C. v.]. **II. Nachtrag zu Studien über Symbiose und Disposition für Parasitenbefall sowie über Vererbung pathologischer Eigenschaften unserer Holzpflanzen. III. Untersuchungen über Zuwachsgang, Wassergehalt, Holzqualität, Erkrankung und Entwertung geharzter Fichten.** [Second supplement to studies on symbiosis and tendency to parasitic infection and on the inheritance of pathological characters in our woody plants. III. Investigations on incremental growth, water content, quality of wood, disease, and degeneration of Spruces denuded of resin.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliii, 8–9, pp. 476–484, 8 figs., 1933.

Of 50 spruces examined in the winter of 1932–3, 17 years after resin extraction, 28 (56 per cent.) showed a decay of the butt, which was found in five of the affected trees to be due to *Trametes*

radiciperda [*Fomes annosus*: *R.A.M.*, xii, p. 727]. The fungus had mostly extended a considerable way up the trunk, being found in one case at a height of 8·30 m. Five other trees were also suffering from an upward spreading butt rot due to an unidentified fungus.

Wałek-Czernecka (Anna). **Grzyby niszczące podkłady kolejowe w Polsce.** [Fungi that destroy railway sleepers in Poland.]—*Acta Soc. Bot. Poloniae*, x, 2, pp. 179–290, 8 pl., 44 figs., 1933. [French summary.]

The bulk of this paper is given to a detailed and fully illustrated description of the development in pure culture on synthetic and natural substrata of 21 species of Basidiomycetes which were isolated by the author from decaying railway sleepers in Poland, and some of which were maintained in culture for periods of over two years. The species most frequently found on fir sleepers were *Lentinus squamosus* [*L. lepideus*], *Paxillus acheruntius* [*P. panuoides*: *R.A.M.*, ix, p. 422], *Coriolus* [*Polystictus*] *versicolor*, *Poria vaillantii* [*P. vaporaria*], *P. callosa*, and *Trametes squalens*, among which the first named is stated to be the most frequent and most dangerous, inasmuch as it readily rots both sapwood and the heartwood. Oak sleepers were found to be attacked chiefly by *Daedalea quercina*. All the species, with the exception of *Armillaria mellea* and *P. mucida*, produced fruiting bodies in pure culture.

In discussing the mycelial characters of the fungi in pure culture on blocks of wood, the author states that she found the 'medallion' clamps first described by Falck in species of *Lenzites* and considered to be typical of this genus, to be much more common among lignivorous fungi than was hitherto believed, since she observed them in *L. sepiaria*, *Lentinus lepideus*, *T. trabea*, *Leptoporus* [*Polyporus*] *destructor*, *Poria vaporaria*, *P. callosa*, and *D. quercina*. She was also able to confirm Falck's account of the origin and morphological features of the chlamydospores which develop on the mycelium submerged in agar media. Similar chlamydospores occur inside the wood cells attacked by *P. vaporaria*, and also on the aerial mycelium of *T. squalens* growing on agar.

Rhodes (F. H.) & Erickson (I.). **Efficiencies of tar oil components as preservative for timber.**—*Indus. & Engin. Chem.*, xxv, 9, pp. 989–991, 1933.

Continuing the investigations of Rhodes and Gardner on the relative toxicity to *Fomes annosus* of various coal-tar compounds [*R.A.M.*, ix, p. 619], the writers tested the preservative efficiencies of distilled dead oil (190° to 310° C.) with the addition of known amounts of *m*-cresol, *o*-cresol, diphenyl, naphthalene, α-methyl-naphthalene, and β-methyl-naphthalene. It was found that none of the substances in question is primarily responsible for the preservative action of the oil. In general, naphthalene and the methyl naphthalenes have about the same preservative efficiency as the lower fractions of the normal dead oil, the toxicity of which is not increased by their addition. Phenol and cresol are no more effective as fungicides than are the neutral aromatic hydrocarbons, so that any advantage accruing from the presence of the tar acid

in the oil must be due to causes other than the increase of fungicidal capacity. Diphenyl alone among the compounds studied shows slightly more than the average preservative efficacy.

The oils from water-gas tar were found to be only about half as effective preservatives as those from coal-tar; the fraction distilling between 247° and 260° has a definitely higher preservative power than any other. The chloronaphthalenes were found to be slightly more toxic than naphthalene itself.

GREAVES (C.). **Leaching tests in water-soluble wood-preservatives.**—*Dept. of the Interior, Canada, Forest Service Circ.* 36, 15 pp., 1 fig., 1933.

A detailed, fully tabulated account is given of the writer's tests to determine the comparative resistance to leaching-out of four water-soluble preservatives used in the treatment of white pine [*Pinus strobus*], viz., zinc chloride (2 per cent.), sodium fluoride (1·5 per cent.), copper sulphate (2·5 per cent.), and dinitrophenol (0·4 per cent.).

Neither zinc chloride nor sodium fluoride proved very resistant to leaching-out, up to 86 per cent. of the former and 81 per cent. of the latter being lost from blocks 3·65 in. in diameter. Determinations of the zinc and chlorine contents of the same pieces of wood showed that the chlorine is more readily washed away than the zinc, whence it may be inferred that the good service results given by zinc chloride treatment are due to the retention of the zinc as insoluble basic chlorides. A preliminary injection of seasoned wood with crude oil before the usual zinc chloride treatment was found to be very effective in decreasing lixiviation. A second treatment with insoluble copper ferrocyanide completely prevented the leaching out of copper sulphate, 13 per cent. of which was lost from the blocks not receiving the supplementary application. The amounts of dinitrophenol leached out were 41·3 and 44·3 per cent,, respectively, in two lots of blocks, figures comparing favourably with those obtained for zinc chloride and sodium fluoride, especially in view of the greater severity of the dinitrophenol tests [cf. *R.A.M.*, xii, p. 342].

KALSHOVEN (L. G. E.). **Een nieuw middel voor houtconserveering: het xylamon.** [A new preparation for wood preservation: xylamon.]—*De Bergcultures*, vii, 36, pp. 1006–1008, 1933.

Details are given of the various brands of xylamon [*R.A.M.*, xi, p. 414] now on the market from the Consolidirte Alkaliwerke, Westeregeln, Magdeburg, Germany, with notes on the applicability of each for different purposes in timber preservation. Xylamon-paste, incorporated with xylamon-natur, is specially recommended for protection against fungi; the latter is the cheapest of the available preparations, its price in the Dutch East Indies being Fl. 2·70 per 5 kg. The name xylamon is stated to represent a group of chemical products known as 'chlorinated carburetted hydrogens' and consisting of thinly fluid oils with a characteristic pungent odour. They are insoluble in water and may therefore be safely used in bathing establishments and the like. Xylamon

should be applied to dry, rough surfaces at the rate of 1 kg. per 4 sq. m., two to three times as much being necessary for smooth surfaces.

Vegetable diseases. A brief summary.—*Min. of Agric. & Fish. Bull.* 68, 38 pp., 1933.

An annotated list is given of the fungous, bacterial, virus, and physiological diseases affecting vegetables (including rhubarb and tomatoes) in Great Britain, based on information collected over a lengthy period by the Plant Pathological Laboratory of the Ministry of Agriculture. To the standardized common names of the diseases [*R.A.M.*, xii, p. 233] is added the scientific name of the pathogen (where one is concerned), the symptoms are concisely described in semi-popular terms, and control measures are briefly indicated. The bibliography comprises 156 titles.

Ogilvie (L.) & Mulligan (B. O.). **Progress report on vegetable diseases. IV.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1932*, pp. 103–120, 4 pl., [1933].

This report contains among others the following items of phytopathological interest. Halo blight (*Bacterium medicaginis* var. *phaseolicola*) of dwarf beans [*Phaseolus vulgaris*] was again prevalent in the Evesham area [*R.A.M.*, xi, p. 759]; the Black Wonder, Ne Plus Ultra, and Superlative varieties again showed satisfactory resistance, and to these are now added Abondant, Black Prince, and Unrivalled. The disease occurs on most of the common varieties of runner beans [*P. multiflorus*] in the Evesham area, but on these systemic infection is uncommon and there is little check to growth. In certain areas on the banks of the Severn large patches of runner beans showed a wilt associated with a *Fusarium*.

The most serious disease of lettuce in the Bristol district was a dying-off of winter varieties which was often prevalent in early spring. The decay usually commences in the older, moribund leaves and thence penetrates the stem, resulting in a pinkish rot. Most of this stem-rotting is now attributed to a *Botrytis*, not to the organism resembling *Bacterium vitians* that was previously thought to be responsible [ibid., xi, p. 144].

Comparison with *F. martii* var. *pisi* (isolated in the United States) of the *Fusarium* associated with a foot rot of peas [loc. cit.] indicated that they were probably identical. Severely affected plants also showed the presence of *Heterodera schachtii* on the roots, but the part played by the eelworm has still to be ascertained. In a pot test with peas grown from seed taken from pods heavily infected with both *Ascochyta pisi* and *Mycosphaerella pinodes* [ibid., xi, p. 759], disinfection of the seed with ceresan and potassium permanganate gave 68 and 62 per cent. healthy plants after 68 days, as compared with only 18 per cent. in the untreated controls. Seed taken from pods of Union Jack peas infected with *A. pisi* or *M. pinodes* and kept on damp filter paper for eight days at room temperature gave 50 and 54 per cent. infected seedlings, respectively, the corresponding figures for the Radio variety being 60 and 62 per cent.

GOUMY (H.). **Principales maladies des légumes d'arrière-saison.** [The principal diseases of late-season legumes.]—*Journ. d'Agric. Prat.*, N.S., xcvii, 34, pp. 180–181, 1933.

Popular notes are given on the symptoms and control of the following diseases of late-season vegetables in France: celery rust [*Septoria apii*: *R.A.M.*, xii, p. 743], spinach mildew [*Peronospora effusa*: ibid., xii, p. 417], bean [*Phaseolus vulgaris*] anthracnose [*Colletotrichum lindemuthianum*] and rust [*Uromyces appendiculatus*], and tomato canker [*Didymella lycopersici*], septoriosis [*Septoria lycopersici*], and mildew [*Cladosporium fulvum*: ibid., xiii, p. 10 *et passim*].

ROCHLIN (E[MILIA] J.). К вопросу о невосприимчивости крестоцветных к **Plasmodiophora brassicae Wor.** [On the question of the non-susceptibility of Cruciferae to *Plasmodiophora brassicae* Wor.]—*Bull. Plant Prot.*, Ser. II: *Phytopath.*, Leningrad, 3, pp. 8–31, 2 pl., 7 figs., 1933. [English summary.]

The results of experiments in 1930 and 1931 in the neighbourhood of Leningrad, in which 47 cultivated and wild species belonging to 14 genera of the Cruciferae were tested for their relative susceptibility to infection with *Plasmodiophora brassicae* [cf. *R.A.M.*, xii, p. 607; xiii, p. 2] in naturally infected soil to which cultures of the organism were added, showed that the reaction varied from complete immunity in some to complete susceptibility in others, independently of their taxonomic position, all gradations of susceptibility occurring within one and the same genus (e.g. *Brassica nigra* none infected, *B. oleracea* 100 per cent.; *Barbarea vulgaris* 0, *B. rupicola* 99 per cent.; *Cochlearia officinalis* 0, *C. danica* 75 per cent.; *Hesperis alpina* and *H. fragrans* 0, *H. lutea* 100 per cent.). A comparative study of the anatomical details of the plants indicated that in the early stages of growth their immunity or susceptibility is not related to any marked differences in the structure of their roots which, under natural conditions, are the first organs to be attacked by the parasite through the root hairs [ibid., x, p. 3; xi, p. 16] and epidermal cells, entry through which was observed by the author. In adult plants, however, the penetration and spread of *P. brassicae* was found to be hindered to a certain degree by the development of layers of cork, by the collenchyma, and by the more compact structure of the wood layers. Inside the tissues the organism spreads both by migration and by division of the invaded cells; there was evidence that it has a disintegrating effect on the walls of the host cells, the chemical composition of which it is able to alter.

A direct relationship was found between the degree of resistance exhibited by a given species and the amount contained in it of those glucosides which on fermentation with myrosin produce highly pungent mustard oils. Chief among such glucosides in the Cruciferae are stated to be sinigrin which is present in many species, particularly in *Brassica nigra* and horse-radish, and in smaller amounts in *Sinapis* [*B.*] *juncea*, *B. rapa*, *B. napus*, &c.; gluconasturtiin in *Barbarea praecox* and *Nasturtium officinale*; glucotropaeolin in *Lepidium sativum*, and glucocochlearin. Sinalbin, a glucoside present in *B. alba*, does not yield a pungent

mustard oil, and was not found to protect against infection with *P. brassicae*. An indication of the possible use of the active glucosides or their derivatives as fungicides was obtained in a small experiment, needing confirmation on a larger scale, in which seeds of the very susceptible Brunswick cabbage were sown in highly infected soil, in pots, some of which were abundantly watered with a water extract from *B. nigra* seeds. In these the cabbage seedlings only gave 20 per cent. infection, the sole symptom of which was a very slight swelling of the roots, while in the control pots all the seedlings were severely infected.

From a practical point of view the results of this investigation are believed to indicate the possibility of controlling club root in the Cruciferae by crossing the species deficient or less rich in the active glucosides with those that contain higher amounts of them, and a brief reference is made to the results obtained by G. D. Karpetchenko, of the Pan-Soviet Plant Breeding Institute, who succeeded in obtaining tetraploid hybrids of radish and cabbage exhibiting new morphological, anatomical, and physiological features, and which were further successfully crossed with mustard, swedes, turnips, wild radish, and Chinese cabbage.

Naoumova (Mme N. A.). К выяснению влияния почвенных факторов на развитие килы крестоцветных. [Contribution to the knowledge of the influence of soil factors on the development of club root in the Cruciferae.]—*Bull. Plant Prot.*, Ser. II: *Phytopath.*, Leningrad, 3, pp. 32–50, 3 pl., 2 graphs, 1933. [English summary.]

Details are given of experiments in the neighbourhood of Leningrad, in which healthy 30-day-old seedlings of the Brunswick cabbage, highly susceptible to *Plasmodiophora brassicae* [see preceding abstract], were planted in containers with two different types of soil, namely a heavy argillaceous, and a light kitchen-garden soil, rich in humus, both of which were then inoculated with similar amounts of the club root organism, and the hydrogen-ion concentration adjusted to comparable P_H values. In preliminary tests, the development of infection appeared to be much more vigorous in the kitchen-garden soil (80·2 per cent.) than in the argillaceous (33 per cent.), a fact which may be correlated with the different degrees of hygroscopicity (7·17 and 4 per cent., respectively) and the different water-holding capacity (125·5 and 32·97 per cent., respectively) of the two soils.

The results of the main experiments showed that in both types of soil the cabbage seedlings were infected within a range of soil moisture from 45 to 100 per cent. of the total water-holding capacity, with an optimum at 80 per cent.; at 30 per cent. no development of the disease resulted. The cabbage seedlings exhibited a strong response in the anatomical features of their roots to variations of soil moisture and reaction. With a water content of about 45 per cent. the roots assumed a xerophytic type which, as the amount of water in the soil increased to 80 per cent., gradually changed to a hydrophytic type. The addition of sulphuric acid tended to have an effect similar to that of excess of water, while sodium carbonate had the reverse effect. It was

further shown that the development of *P. brassicae* inside the host tissues is to a certain degree governed by the anatomical structure of the latter [loc. cit.], inasmuch as the mechanical elements present in the roots of the xerophytic type appear to resist the penetration of the parasite. Infection of the seedlings occurred within a range of P_H values from 5·7 to 8·4, with an optimum near neutrality. The reduction in incidence was most pronounced on the alkaline side of the scale.

The whole investigation is considered to indicate that the intensity of infection of a susceptible host with *P. brassicae* is a function of many intimately connected external factors, such as the degree of infection of the soil, its moisture content and reaction, the anatomical structure of the host, and the like, and is not dependent on the hydrogen-ion concentration of the soil alone.

Fedotova (Mme T. I.). К методике определения зараженности почв килою (**Plasmodiophora brassicae Wor.**). [Contribution to the evolvement of a method for the evaluation of soil infection with club root (*Plasmodiophora brassicae* Wor.).]—*Bull. Plant Prot.*, Ser. II: *Phytopath.*, Leningrad, 3, pp. 51–81, 1 pl., 5 figs., 1 graph, 1933. [English summary.]

After a brief reference to the practical importance, for control purposes (especially in seed-beds and garden plots), of an accurate estimation of the degree of infection of the soil with the club root organism (*Plasmodiophora brassicae*) [see preceding abstracts], the author states that none of the methods previously employed in mycological and bacteriological practice tested by her gave satisfactory results. The nearest approximation to a correct computation of the actual number of *P. brassicae* spores in infected soils was obtained by a new and rather complicated double method [a detailed description of which is given]. Briefly stated, this method consists, on the one hand, in the preparation from a water suspension of average soil samples, of a number of microscopical mounts under square cover glasses, stained with cotton blue or neutral red, and in counting the actual number of the spores present in at least twelve optical fields of each mount. On the other hand, portions of the same samples are repeatedly (up to 10 times) washed in equal amounts of water, and the number of spores present in each washing are separately counted and added in a grand total, the results of both operations being then compared and averaged. This method should be supplemented by the determination of the percentage of spores that are in a viable condition in the soil, for which purpose the plasmolysing effect of concentrated sugar solutions on the living spores of *P. brassicae* [*R.A.M.*, viii, p. 747] may be successfully used. Preliminary tests indicated that the soil samples should not be kept for longer than four days under laboratory conditions, as the viability of the *P. brassicae* spores contained in them rapidly declines after this interval.

Baillie (D. W.) & Muskett (A. E.). **The control of finger and toe of Broccoli in County Down.**—*Journ. Min. Agric. Northern Ireland*, iv, pp. 44–46, 1 pl., 1933.

In a series of tests conducted in 1931–2 at Warrenpoint, County

Down, to determine the relative value of mercuric chloride (1 in 1,000), powdered calomel [mercurous chloride], and slaked lime (4 tons per acre) in the control of club root of broccoli [*Plasmodiophora brassicae*: see preceding abstracts], the first named proved much the most satisfactory [*R.A.M.*, xi, p. 17]. Ninety per cent. of the April Queen and Victory plants so treated produced good heads realizing 1*s.* 6*d.* to 3*s.* per dozen for an initial outlay of 10*d.* per 100 plants.

SNYDER (W. C.). **Variability in the Pea-wilt organism, Fusarium orthoceras var. pisi.**—*Journ. Agric. Res.*, xlvii, 2, pp. 65–88, 3 figs., 1 map, 4 graphs, 1933.

A detailed account is given of the author's cultural and pathogenic studies of 15 strains (isolations) of the pea wilt fungus (*Fusarium orthoceras* var. *pisi*) [*R.A.M.*, xii, p. 547] from eight of the United States, considered to be representative of its distribution. When tested on standard groups of pea varieties the strains gave no indication of variation in host specialization, but they varied somewhat in their relative virulence on a given variety of pea. As a general rule, the differences in virulence were moderate, and further experiments showed that entirely comparable differences frequently occurred between monoconidial lines of a single strain.

In pure culture all the type strains exhibited the same general temperature requirements and had a common optimum range for maximum radial growth, but pronounced differences in colony character were apparent between original isolations from different regions and localities. Monoconidial lines of the strains showed cultural differences of the same order, and it was possible within a given monoconidial line to assemble through the phenomenon of dissociation, a group of cultures almost representative of the whole range of colony type and virulence exhibited by the original strains. The variations appeared to fluctuate within type limits defined by certain cultural characteristics and by a rather specific behaviour in respect to pathogenicity, and no strain studied was sufficiently divergent to give it specific rank.

A comparison of the pea wilt fungus with other vascular species of *Fusarium*, including strains of *Gibberella saubinetii* and *G. moniliformis*, showed a striking general similarity and overlapping of cultural characters, to such an extent as to render them undifferentiable by the ordinary mycological methods, apart from parasitism. The whole investigation tended to support the findings of Brown [ibid., vii, p. 475] in regard to *F.* [*lateritium* var.] *fructigenum*, and of Leonian [ibid., xi, p. 569] in regard to *G. moniliformis*, and is considered to indicate the advisability of simplifying the existing nomenclature of these organisms.

MAGEE (C. J.). **Chocolate spot of Broad Beans.**—*Agric. Gaz. New South Wales*, xliv, 8, p. 580, 1 fig., 1933.

All attempts to isolate a pathogenic organism from the vivid red to reddish-brown, subcircular to circular spots commonly observed on broad bean [*Vicia faba*] leaves in New South Wales have given negative results, although the lesions appear to be identical with those attributed in England to a bacterium [*Bacillus lathyri*:

R.A.M., xiii, p. 8]. The typical spots were found to develop as a result of experimental infestation of the plants by *Aphis rumicis*, appearing in about two days beneath the glistening smears of honeydew excreted by the insects. It is concluded, therefore, that the chocolate-coloured spots are not symptoms of an infectious disease.

SCHMIDT (E. W.). **Natürliche Feinde einiger wichtiger Schadinsekten der Zuckerrübe.** [Natural enemies of some important pests of the Sugar Beet.]—*Deutsche Zuckerind.*, lviii, 35, pp. 709–710, 16 figs., 1933.

Attention is drawn to the widespread occurrence in German sugar beet fields of the entomogenous fungus, *Botrytis* [*Beauveria*] *bassiana*, which is highly destructive to the beet weevil (*Cleonus* [*Bothynoderes*] *punctiventris*) [*R.A.M.*, ix, p. 454]. Estimating the requisite quantity of spores for field disinfection at 8 kg. per hect., E. Metschnikoff actually produced, in his laboratory in Russia in 1884, the relatively immense amount of 55 kg. of pure spores, which proved useless, however, when tested under natural conditions in the field.

SKUDERNA (A. W.), CORMANY (C. E.), & HURST (L. A.). **Effects of time of planting and of fertilizer mixtures on the curly-top resistant Sugar-Beet variety U.S. No. 1 in Idaho.**—*U.S. Dept. of Agric. Circ.* 273, 16 pp., 1 fig., 7 diags., 1932.

The results [which are shown in the form of tables] of experiments in 1931 on the experimental farm near Castleford, Idaho, showed that on unfertilized plots the curly top-resistant U.S. No. 1 variety of sugar beet [*R.A.M.*, xiii, p. 4] sown at an early date (6th April) significantly outyielded later sowings (28th April and 8th May), both in tons of beets and in pounds of sugar per acre. In a further series of tests, the indications were that a fertilizer mixture, in which the percentage of phosphoric acid is high, is likely to give consistently good results in yield of beets and sugar with this variety, especially under cropping and soil conditions necessitating the use of commercial fertilizers. The addition to the mixture of more than 8 per cent. nitrogen resulted, with this variety, in a sharp decrease in the stand of beets.

United States Department of Agriculture. Bureau of Plant Quarantine. Service and regulatory announcements, April–June, 1933. Quarantine and other official announcements. —pp. 185–193, 1933.

ITALY. An Order of 20th December, 1932, effective as from 1st March, 1933, prohibits the importation into, and transit through, Italy of cactus plants and fruits of whatsoever origin owing to the risk of introducing insects, fungi, or bacteria injurious to the prickly pear (*Opuntia ficus-indica*).

GERMANY. A summary is given of the plant quarantine restrictions obtaining in the Republic. [The genus *Pinus* should have been added to the list, given in this *Review*, of prohibited conifer genera under Decree of 3rd June, 1930: *R.A.M.*, ix, p. 816].